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VIEWS, NEWS AND INTERVIEWS.

The United States repair ship "Vulcan" started last week from the Charlestown Navy Yard at Boston for her station with Admiral Sampson's fleet off Santiago, Cuba. The captain of the "Vulcan" is Lieutenant-Commander Ira Harris, who has had many years of experience in rolling mills, machine tool works and foundries. The chief engineer of the ship is Mr. Gardiner C. Sims, of Providence, R. I., who is well known to all electrical men. The "Vulcan" is completely equipped with a modern machine shop and tools sufficient to build almost every part of a ship, including its electrical equipment. The outfit is valued at over $300,000, and the officers in charge of the vessel include some of the best known shipbuilding experts in the country. The "Vulcan" carries a crew of 200 men. She will go first to Fortress Monroe, from which place the cruisers "Newark" and "Harvard" will escort her to Admiral Sampson's fleet.

It is reported that the streets of Skaguay, Alaska, are now illuminated by electric lights, the Alaska Electric Light and Power Company having installed a first-class central station plant at Skaguay.

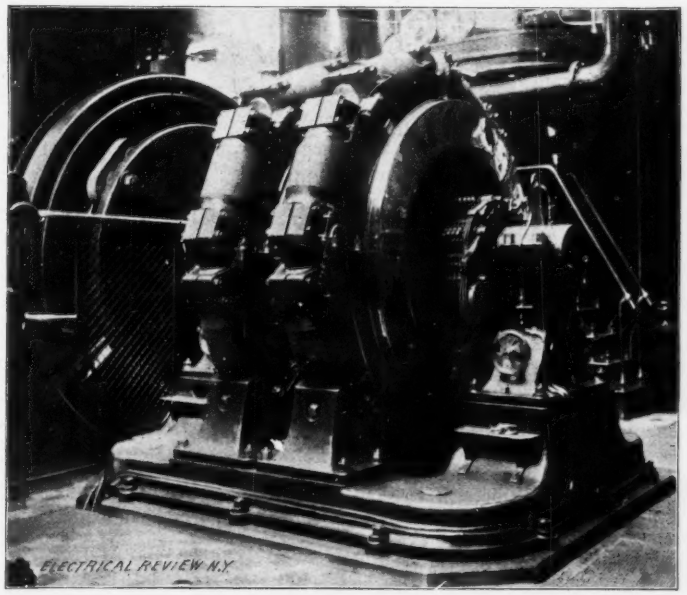
Last week there were shipped to Chickamauga 10 car-loads of hardware, including everything needful for the Engineers' Corps. These goods are intended to be taken to Porto Rico with the troops which go from Camp Thomas. There have also been sent to Tampa for use in Cuba 2,000 wire-cutters. These will make 6,500 wire-cutters that have been sent to General Shafter for cutting the barbed wire of the trochas.

Trains are to cross the English channel without a bridge or a tunnel, if a recently proposed scheme can be made to work, says an exchange. It is to build a submarine track 100 feet wide along the bottom from Dover to Calais, and to run a kind of tower upon it by electricity. The top of the tower would be a platform 500 feet long by 50 feet wide. A little railroad on this principle running between Brighton and Rottingdean has been wrecked more than once by storms. The estimated cost is $70,000,000.

A Chicago dispatch says that conductor Edward Spickney, of the Chicago General Electric Railway Company, one night last week shot and wounded mortally John, alias "Red," Graves, one of a quartet of hold-up robbers. The four men boarded Spickney's car, two in front and two in the rear, and ordered everybody to throw up their hands. Spickney struck one of the robbers a terrific blow in the mouth, knocking him off the car. He then pulled his revolver and shot the second robber. The two men on the front platform ran, but one was caught quickly. Spickney will be rewarded for his bravery.

William, alias Buck Davis, of Troy, N. Y., has been sentenced to six years and six months in Dannemora Prison and to a fine of $1,000 for breaking jail at Salem, Washington County. He escaped last April, and was recaptured in Virginia recently. Among other crimes he is suspected of the murder of counsellor George R. Blodgett, of the General Electric Company, at Schenectady last November.

William E. Jones, an electrician, of Geneva, N. Y., recently received a shock of 2,900 volts at the electric light station. He was working on a new voltmeter attached to the arc circuit, when both his hands came in contact with the wires at once and he received the full force of the current. He was thrown to the floor stiff and senseless. "The next thing I remember," he is quoted as saying, "was a feeling of indescribable terror. My heart throbbed in an effort to continue beating, my muscles seemed paralyzed, and every nerve seemed on fire. My arms were bent double and against my body, my fists were doubled and beating the air. My first effort was to straighten my fingers."



A DIRECT-CONNECTED DYNAMO IN THE EDISON CENTRAL STATION, PARIS.

The ELECTRICAL REVIEW has received the new annual catalogue containing announcements for 1898 and 1899 of Purdue University, Lafayette, Ind. This institution maintains a course in electrical engineering which is in charge of Prof. W. E. Goldsborough.

THE EDISON CENTRAL STATION IN PARIS, FRANCE.

BY L. BAYLY.

The progress of electric lighting and power schemes—always interesting—acquires a special significance in an old-world city like Paris. As might be supposed, innovations of any kind make their debut in a totally different manner to what we are accustomed to on this side of the Atlantic. The introduction of modern improvements into a country of comparatively recent origin, where few settled forms have had time to be acquired, and the adoption of the same improvements in a city of thirteen centuries, where old-fashioned notions rule supreme and the lamp of truth is too oft apt to pale before the glare of inherited tradition, are two very different things. Hence it comes that inventions are seldom "rushed" in Europe. As our bell and burglar-alarm brethren will bear witness, it is a far easier task to "wire" a house in course of construction than to perform the same operation on a finished building.

As might have been expected from precedents of the same kind, the 1888 exhibition has been mainly responsible for the "boom" electrical affairs have taken since that year. The actual concessions granted by the Paris municipal authorities for lighting purposes are six in number—representing *in toto* a power of 1,500,000 kilowatts, and an intricate network of cables, most of them under ground, covers Paris in all directions. A noteworthy feature is that no attempt has been made to monopolize certain streets or directions. Cables belonging to companies of widely different interests cross and recross like patterns in a Chinese puzzle, each new contract being a pretext for an addition or extension from the mains.

We have perhaps to thank the Compagnie d'Eclairage (Saint-Ouen) for the most convincing demonstration of the advantages presented by the long-distance system. The current from the alternating dynamos in use in one of the farther stations of this company, arriving under a ten-

sion of 2,400 volts, is converted down to safe limits by rotating transformers, and the moral pointed to is sufficiently powerful to insure, later on, all central stations being removed from the precincts of habitable Paris and transferred to the outskirts.

If not actually taking the lead among the installations of recent growth, the fine station of the Edison company (Avenue Trudaine) at least deserves detailed description, from the beauty and finish of its mechanical arrangements, as from the fact that it bears on its shoulders the lighting of one of the most important sections of Paris, the Boulevard des Italiens and the Boulevard Montmartre. The building itself is an imposing one. It is divided into three sections; the first (an underground one), containing the boilers; the second (on a level with the street), the dynamos and motors; the third (first floor), the distributing switches, oil tanks, etc.

The boilers are nine in number, of the Belleville pattern, which is the type generally adopted in Paris installations. They work at 150 pounds to the square inch. The unfortunate presence of impurities of a calcareous nature in the water supplied for their consumption has rendered a system of filters necessary, all of them ingenious, but hardly needing detailed description. The steam produced passes on to the ground floor, where six engines, all of them of the vertical pattern and varying from 300 to 1,000 horse-power, are arranged in line.

The first two (1,000 horse-power) are so set up as to act directly on the driving shafts of two monster dynamos (Brown & Company) delivering a current of 4,500 amperes under an electro-motive force of 130 volts. The number of revolutions performed is 105 per minute.

The construction of the dynamos is simple enough, reminding one in general appearance and outline of the now nearly obsolete "Ferranti" machines. The electro-magnets consist of 16 poles of soft iron, mounted on parallel rings of the same metal. The armature revolves between these rings, and the current is carried off by two commutators furnished with carbon brushes. As the weight of the armature is, proportionately to its size, inconsiderable, it would be possible to increase the speed if necessary. The airy structure of the parallel rings constituting the magnetic field also gives considerable ventilating facilities, and danger from heating is hardly to be apprehended.

The circulation of oil in the bearings is managed by machinery. A fixed tank of some 150 gallons capacity distributes a regular supply to the shafts, whence another series of pipes conducts it to a filter. Deprived of its impurities, it is repumped into the reservoir and used over again. The total available power is 600 kilowatts per machine, which means a lighting capacity of from 10,000 to 12,000 lamps.

The four smaller dynamos belong to the neatest contrivances of their class. They bear the signature of Edison on the broad bands of copper encircling the outer rim of their magnets. As is the case with their larger brethren, they are coupled direct (with an intermediate flywheel) to the driving shafts of four three-cylinder expansion engines of the Weyher and Richmond type (300 horse-power —132 revolutions). The magnets are wound in eight coils arranged round the axis in the form of an octagon. The body of the magnets is of Swedish iron, the polar portion (polar circle, in fact) of cast-iron. As in the case of the Brown dynamos, there are two commutators, acted on by eight series of carbon brushes. The current thus produced passes overhead, along a quadruple row of copper rods, to the *table de distribution*; i. e., switch-room. At first sight this gallery resembles nothing more than the signal-box of a mammoth railway junction. The life and light of pretty well 40,000 lamps is controlled from here, and for systematic neatness and finish this admirable wilderness of plugs and cut-outs would be hard to beat. The main current from the generators, before meeting the switch, passes in a double turn round an ammeter of ingenious construction—a rotating globe of copper wire pinioned in the very focus of the current—and across a self-indicating voltmeter furnished with two lamps, a red one and a blue. When overtension is the trouble the red lamp lights of its own accord, should the electro-motive force fall off the blue lamp darts its warning message. Diminutive switches control the formidable array of resistance boxes, which are placed (for even here neatness and finish claim their rights) in such a way as to avoid marring the look of the whole by their necessary ungainliness.

M. D'Honneur, the superintendent, is a pleasant man, and brimful of the technique of his business. He complains amongst other things of a destructive tendency there has been to import worthless lamps of foreign make in place of the better but more expensive ones manufactured at home. These goods are rarely durable. The filament shakes itself loose, crumbles or allows itself to be deposited smoke-fashion on the inside of the lamp bulbs.

Mr. Charles Clark, a telegraph operator at Cairo, Ill., has been nominated in the United States Senate to be first lieutenant of the Volunteer Signal Corps.

Independent Telephone Association of the United States of America.

Second Annual Convention Held at Chicago, June 30 and July 1 and 2.

REPORTS SHOW ASSOCIATION IN GOOD CONDITION—MANY IMPORTANT AND PRACTICAL QUESTIONS DISCUSSED.

The delegates and visitors to the second annual convention of the Independent Telephone Association began to arrive early Thursday morning, and were heartily welcomed by a score of Chicago's telephone manufacturers, members of the electrical press and friends in general, who, from the start, made it plainly understood that no member of the association or his friends should feel neglected during his stay in Chicago. While some of the officers and delegates arrived promptly a good many were delayed, and did not arrive until late in the evening or early Tuesday morning, so President Thomas announced in the afternoon that the first regular convention meeting would not be held until 9 A. M. Friday. Several committees held preliminary meetings Thursday afternoon so as to be ready to make their complete reports when called.

FRIDAY, JULY 1.

By the time President Thomas called the meeting to order at 9.30 o'clock Friday morning the attendance had increased to a gratifying extent, representatives from independent exchanges and toll-lines from 14 states being present. A great deal of enthusiasm and interest in general was manifest, and reports from all sections of the country showed a very vigorous growth and extension of the independent telephone movement throughout the United States. The programme, as arranged, was then carried out, but on account of the press and public being rigorously excluded from the sessions, the details of various discussions could not be obtained.

A committee, consisting of H. D. Critchfield, of Ohio, S. P. Scherin, of Indiana, and H. K. Cole, of Kentucky, was appointed to propose changes in the constitution as adopted at Detroit in June, 1897. This committee submitted the following report, which, after full discussion, was unanimously adopted:

REPORT OF COMMITTEE.

Your committee, to which was referred the proposed changes to the constitution of the Independent Telephone Association of the United States, beg leave to submit the following report:

We recommend first that section 2 of article 3 be amended so as to read as follows:

SEC. 2—The payment from time to time of such further assessments as the association through its proper committee may levy, not to exceed in any one year 10 cents for each telephone in use by any exchange or toll line company, and 10 cents per mile of toll lines carrying a wire or wires over which paid messages are transmitted.

SEC. 3, ART. III—Any corporation, partnership or individual engaged in the manufacture of telephones and switchboards, or either, may become a member of this association upon payment of a membership fee of $10 and annual dues in the sum of $100. The membership fee to be paid but once and the annual dues for the first year to accompany said membership fee, and be paid annually thereafter upon notification by the secretary of the association.

Any corporation, partnership or individual engaged in the sale of apparatus or materials used in the construction, operation or maintenance of an independent telephone exchange, toll line or system, except such corporation, partnership or individual as may be engaged in the manufacture and sale of switchboards and telephones, or either, may become a member of this association upon payment of a membership fee of $10 and annual dues in the sum of $50, to be paid in like manner and time as hereinbefore provided for the payment of the same by manufacturers of telephones and switchboards.

SEC. 4, ART. IV—The officers of this association shall be a president, three vice-presidents, a secretary, two assistant secretaries, a treasurer, and an advisory board consisting of nine members, two of whom shall be the president and secretary of this association, together with seven members who shall be selected by the executive committee. The president and secretary of the association shall be ex-officio chairman and secretary of the advisory board and executive committee respectively; provided, however, that no person representing either himself or any firm or corporation admitted to membership under the provisions of Section 3 of Article III of this constitution, may be elected to or hold an office therein.

ART. III—Each member of this association shall be entitled to one vote for each 500 telephones or less, or for each 500 miles of toll lines or less, in actual use, and one additional vote for a major fraction of 500 telephones or miles of toll line in actual use, and no more, on the election of officers or as to any question which may be voted upon by said association, provided, however, that each person, firm or corporation admitted to membership under Section 3 of Article III of said constitution shall be entitled to one vote.

ART. IV—The officers of this association shall be a president, three vice-presidents, a secretary and treasurer in one person, two assistant secretaries, and an advisory board consisting of five members, two of whom shall be the president and secretary of this association, together with three others who shall be selected by the executive committee. The president and secretary of the association shall be ex-officio chairman and secretary of the advisory board and executive committee, provided, however, that no person financially interested in the manufacture or sale of telephones or supplies or materials used in the construction, operation or maintenance of a telephone exchange or toll lines, shall be eligible as an officer or member of the executive committee of said association.

ART. VI—The association shall elect an executive committee, which shall consist of one member from each state, each state, through its delegates, to suggest the name of the member of said committee to represent such state. Should any state be without representation in the convention the convention shall then select one member from such state, who shall act until the vacancy shall be properly filled under this article. The executive committee shall, with the consent of the advisory board, select such sub-committees as it deems expedient and necessary, and shall fully empower such sub-committees to carry out the object for which they were created.

SEC. 3, ART. VII—The secretary and treasurer shall keep the minutes of the association. He shall collect all moneys and receipt for the same. He shall pay all properly executed orders and drafts provided for in this constitution, and all other orders signed by the president under the direction of the advisory board. He shall keep an accurate account of all receipts and disbursements of money and make a report thereof at each annual meeting of the association and to the executive committee and advisory board whenever called upon so to do. He shall issue and mail all official calls and perform all other duties required of him by the association. He shall receive such salary, not to exceed four hundred dollars ($400) per year, as may be fixed by the executive committee, and shall have an allowance for expenses to be paid upon the approval of the advisory board on presentation of properly executed vouchers. His salary shall be paid at the end of each quarter by draft upon the treasurer. He shall give bond in such sum as the executive committee may require, with security, to be approved by the advisory board.

Your committee further recommend that Section 5 of Article VII be stricken out, and that the offices of secretary and treasurer shall be vested in one person.

(Concluded on page 11.)

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

FIFTEENTH GENERAL MEETING HELD AT OMAHA, JUNE 27–30.

From an almost tropical temperature of last week, when the mercury hovered around the nineties, the weather settled down to a most enjoyable kind, just right for the opening day of the institute meeting, whose members came for the double purpose of taking part in its proceedings and to visit the Trans-Mississippi and International Exposition. A conveniently located assembly hall had been secured in the Bee Building, where, at 10.30 on the morning of June 27, President A. E. Kennelly called the meeting to order. On account of the absence of Mayor Moores, President Kennelly introduced Acting Mayor and President of the City Council W. W. Bingham, who delivered an address of welcome, in which he referred to the high appreciation on the part of the city of the importance of the meeting of such a prominent body of scientific men, bidding them a hearty welcome and extending the freedom of the city. As a token of sincerity of his remarks at the conclusion of his address, Mr. Bingham presented the keys of the city, two immense gilt affairs, suitably inscribed, to President Kennelly, who accepted them on behalf of the Institute, and replied with some appropriate remarks.

President G. W. Wattles, of the exposition, then addressed the meeting, heartily welcoming the members and visitors to Omaha and especially to the exposition. In his remarks President Wattles called attention to the desire of the exposition management to have the electrical features and displays equal or surpass anything heretofore attempted. With this object in view, the services of Mr. Luther Stieringer and his constructing and operating engineer, Mr. Henry Rustin, were secured on the recommendation of Mr. Thos. A. Edison, with the result, as all must admit, that the electrical display stands as a masterpiece of fine electric lighting effects, which when seen can not fail to be highly appreciated by all. President Wattles then spoke of the great aid electrical development of the last 20, or even 10, years had given to the rapid progress of all industries, believing it to have been a greater factor than any other science or art. In commenting on the somewhat small attendance at the first meeting, Mr. Wattles said that the men with whom the members are working had more influence upon the progress of the country or of the entire world than any other class of people. He considered their attendance an honor to the exposition, and, like the Mayor, was glad to present the keys to the exposition grounds, which, while not as large, were equally efficient in securing admittance.

President Kennelly next introduced Mr. E. Rosewater, chief of the department of publicity, who in a happy vein told the interested audience about his early experiences, commencing some 40 years ago, in the telegraph business, and commented upon the immense strides that have been made since then. In the course of his remarks, Mr. Rosewater related a number of anecdotes of the condition of telegraphy during the Civil War, when he was engaged in it. Another of the welcoming citizens was Col. J. J. Dickey, district superintendent of the Western Union Telegraph Company, who in a most genial manner greeted the delegates, not only as a man engaged in the profession and as a citizen of Omaha, but also as a member of the Court of Ak-Sar-Ben, the board of directors of which extended an invitation to attend the festivities in the den at 7.30 that evening.

After again thanking the several speakers for their welcoming words and accepting the invitations, President Kennelly read his inaugural address. In his paper he sketched the growth of electrical science in the last 15 years—from 1884, the date of the institute's birth. He related the marvelous progress that had been made in all branches in a financial, scientific and experimental way. He touched upon the fact that while in 1884 less than $1,000,000 was invested in electrical appliances, to-day the amount is not far from $900,000,000. The paper was very exhaustive and thorough, sketching seriatim the great strides made in telegraphy, telephony, electric lighting and railways and the minor branches, down to Roentgen-ray apparatus and wireless telegraphy, which he declared was fast passing the experimental stage and will soon enter practical service.

The address received the closest attention, and at its conclusion was greeted with well merited applause.

The papers by C. P. Steinmetz on "The Dielectric Strength of Air," John W. Howell on "Two-Wire Distributing Systems and Lamps at 220–240 Volts," and by Chas. F. Burgess on "A Capillary Electrometer for Electrical Measurements," were then presented in the order named, each eliciting more or less discussion. Mr. Howell's paper, on account of the author's absence, was read by Secretary Pope. The meeting closed its first day's session at 1.30 P. M.

At 2.30 in the afternoon the majority of the members made an excursion to inspect the Omaha and Grant Smelting Works and the Union Pacific shops, both visits proving extremely interesting and instructive, many of the delegates never having had an opportunity to so thoroughly examine the various stages of manufacture entering into the finished product. The stay at the smelting works was especially long, owing to the attractiveness of the place, where one could watch the various processes under which the crude ore is step by step transformed into either pure lead, silver or gold, several by-products forming an important item in the output of the works. When it is stated that the daily average output of the smelting works consists of gold to the amount of $22,000, silver worth $35,000, lead to the amount of 250 tons, metallic copper weighing 20 tons and some 15 tons of copper sulphate, one begins to have an idea of the magnitude of the works.

At 7.30 in the evening some 25 or 30 of the members and visitors were conducted in a body to the den of Ak-Sar-Ben, a local organization of prominent business men in Omaha, who, as stated, had extended an invitation to the members to become initiated into the weird mysteries of the order. The ceremonies were of the most impressive and enjoyable kind, lasting some three hours. When finally the members, under the guidance of Mr. Luther Stieringer, departed to the exposition grounds in order to enjoy a preliminary view of the electrical illumination, they left with the kindliest feelings towards the noble knights of the order, and with a high appreciation of its worthy aims.

TUESDAY, JUNE 28, 1898.

The meeting was called to order at 9.30 A. M., President A. E. Kennelly in the chair. The first paper read was that by Mr. Geo. A. Damon, of Chicago, on "A Modern Central Station." The paper was well received, and showed unusual care in its preparation. After considerable discussion of the points intended to be brought out by the author, Dr. Francis B. Crocker read the "Preliminary Report of Committee on Standardization." This proved to be one of the most important and far-reaching topics in the list of subjects for consideration, resulting in the most lively discussion, which took up the remainder of the session, to the exclusion of other items on the programme. Among those participating in the debate were Prof. F. E. Badt, B. J. Arnold, A. E. Kennelly, Chas. P. Steinmetz, Geo. D. Shepardson and Chas. F. Scott.

The meeting adjourned at 1 P. M., and, after a lunch prepared in the ante-room, the members and friends left for the White City to spend the afternoon and evening, special features of entertainment having been provided by the committee.

WEDNESDAY, JUNE 29.

Promptly at nine o'clock the meeting was called to order, and Mr. Ernest J. Berg, of Schenectady, read his paper on "Transmission and Distribution of Power for Railway Service," followed by Mr. Albert H. Armstrong's paper on "Some Phases of the Rapid Transit Problem." Both papers were well discussed. Prof. George I. Shepardson, of the University of Minnesota, next read a paper on the telephonic disturbances in Minneapolis, caused by the recent changes in railway circuits and the three-phase rotary converters in the new hydraulic power plant.

A motion to adopt the committee's report on a memorial of the late Dr. Charles E. Emory was carried.

Adjourned at one o'clock until nine o'clock Thursday morning.

The trip to South Omaha in the afternoon and the trolley party in the evening were both well attended, and gave the visitors a good idea of Omaha's manufacturing interests on one hand and its extensive and well operated street railway system on the other.

The programme for Thursday and Friday was carried out as announced.

Prof. R. B. Owens, director of the departments of machinery and electricity, did much to provide for the comfort of the visitors, and was much complimented on the completeness of the arrangements made for the meeting. It was quite a task to be at the meeting one time and hurry to the exposition grounds the next, to answer the many questions of visitors, but Prof. Owens seemed to have a faculty of being everywhere just at the right time.

Chancellor McGill, at Jersey City, has signed an order directing James E. Degnan, receiver of the Atlantic Highlands & Sea Beach Railway Company, to prepare a statement of the company's affairs without delay, so that a plan may be formulated which will place the company on a good financial basis.

TOLD IN THE DYNAMO-ROOM—XII.

"Speaking of lightning arresters," remarked Gus, who for some time had been engaged in filing the beads of melted brass off the plates on some old-style arresters which had received rather severe treatment during a heavy storm the night before, "I wish the boss would hurry up and buy enough of that 'Western' kind to equip all our circuits with. They seem to be the only ones that fill the bill."

"Yes, that's so," replied Ned, to whom Gus was addressing his remarks. "I heard Mr. Evans say this morning that the order had been placed some time ago. But do you know why the 'Western' arresters work so well?"

"No, I do not; perhaps you can explain it. I believe you said the other day that you had had considerable experience with lightning discharges."

"Oh, nothing to brag about," modestly spoke the dynamo man. "The most interesting case of a lightning discharge I witnessed happened in a place called Porterville, where I was stopping for a few days last Summer, and, of course, visited the local plant several times. One afternoon I saw a young fellow trying to smooth a commutator that had a flat in it. He took a mill file, and, folding a nice, new piece of emery cloth around it, started to work, having given the engine just enough steam to drive the generator at a moderate speed. The lightning discharge he received when the superintendent came in was a caution."

"Well, the blamed idiot," exclaimed Benson, who had overheard Ned's story. "How do butchers like that ever get inside of a station?"

"I often wonder myself," spoke Ned, smiling at his own joke. "But to answer Gus's question, it is surprising how many so-called lightning arresters are made without the least attention to the most elementary laws about static charges and discharges. Now, in the first place," filling his briar pipe from a little bag of Durham tobacco, which articles had been presented to each of the boys by Mr. Evans, being some of the many convention souvenirs that gentleman had brought home a few days ago, "what makes the lightning always jump through the armature or field-coil insulation to the core and thereby to the ground, instead of following the copper wire on the machine?" looking inquiringly at Gus.

"Oh, I suppose because the dynamo current is of a certain polarity and the lightning the same, and you know like currents repel each other, or something of that sort," confidently replied the lineman.

"No, that isn't quite it," answered Ned. "You see, during storms overhead circuits become highly charged with an induced static electricity. This means a difference of potential either between the line and the earth or between the different sides of the circuit. Now this static electricity is not of the nice, smooth-flowing kind, but of a highly oscillatory character——"

"Now, Ned," interposed Benson, who, as usual, proved a very attentive listener, "there you come with one of your college words again."

"You mean oscillatory, I suppose. Well, it means fluctuating, or having a motion to and fro; to change rapidly back and forth."

"Something like a pendulum, eh?" ventured Gus.

"Yes, only much more rapidly," continued Ned. "As I said, owing to its oscillatory character, this static electricity hates a coil, and when the discharge tries to find a way to the ground through the coils of a dynamo, it punctures the insulation and takes the path of least resistance to the earth, which usually is through the layers of wire to the armature core, or sometimes through the air-gap to the pole-pieces."

"Well, upon that theory, the ordinary saw-tooth arrester is all right," suggested Gus, "because you can adjust it to offer a very small air-gap to the discharge."

"Yes, certainly; but what about your regular current, which always follows the line of lower resistance established by the discharge, causing a ground or short-circuit and then a burn-out? The air-gap principle is all right, but it must be supplemented by a reliable and simple device, which will interrupt the flow of normal current, which, as I said, nearly always follows a discharge through an arrester."

"Well, say, Ned, you have explained that very clearly, and I have learned a heap," remarked Gus. "And what you said about circuits becoming charged with static electricity explains a curious thing that happened to me out in Nebraska one Winter when I was running the Asheville plant. I had charge of an A-35 Thomson-Houston alternator, run in connection with a flouring mill by water-power. It was a terribly cold evening, with the mercury about 25 degrees below and the wind blowing some 40 miles an hour. Everything was as dry as a bone, for we hadn't had a drop of rain all Summer—1894, I think it was. I had just closed the switch, tightened the belt, and turning on the water soon had the machine up to voltage. Suddenly I saw a flash or spark spurt up radially from the commutator, midway between the brushes. This was followed by a second flash, spurting up into the air some three or four inches, accompanied by that snapping, crackling sound like lightning. By this time more lights were being switched on, and I had to turn on more water, there being no governor on the turbine.

"Now the gate-stem was geared to a hand-wheel in the dynamo-room by means of chains and sprocket wheels, one of the chains crossing the dynamo belt within a distance of about 12 inches. The instant I took hold of the hand-wheel I wished I had never started in the business, for I let go instanter, and, as I did so, I saw long, greenish sparks come from my fingers' ends and a big flash at the exciter commutator. My hand felt as if I had just pulled it out of a hornets' nest, and, being new in the business, I decided to quit then and there."

"Well, it seems you didn't, did you?" asked Benson.

"No, for I decided to try it once more the next evening, and, strange to say, I never had any trouble of that kind afterwards."

"That was a peculiar case, surely," remarked Ned, as he began to adjust the brushes of the machines preparatory to starting up. "But it was undoubtedly a severe case of 'static.' We can easily guard against such things to-day, and, by using properly designed arresters, experience little or no trouble."

"Yes," added the thoughtful Benson, "and if we don't stop this continued story-telling and 'tend more to business we'll all experience trouble by getting a sudden discharge from the boss, like Ned's friend in Porterville."

Convention of Edison Illuminating Companies.

The next convention of the Association of Edison Illuminating Companies will be held on September 13, 14 and 15. While the place at which the convention will meet has not been definitely decided upon, it is probable that Sault Ste. Marie will be selected.

TELEPHONE NEWS AND COMMENT.

The telephone system is being largely extended in Japan, a survey having been completed for a proposed line between Tokio and Osaka, upon which the work will soon be commenced.

The Bell Telephone Company has awarded to Sweeter & Son the contract to construct a fine new office building and exchange at the corner of Fifth and Market streets, Camden, N. J. Work will begin in a few days.

The Western Union Telegraph Company has extended its lines to British Columbia and opened its own office at Victoria. The rate is 75 cents for 10 words, instead of $1.35 as heretofore. This is a reduction of 60 cents on every 10-word message.

At the annual meeting of the New Sharon and Norridgewock, Me., Telephone Company, the following officers were elected: W. F. Brown, president; F. C. Hale, secretary and treasurer; F. C. Hale, Geo. Chandler, C. H. Allen, W. F. Brown, E. L. Lowe, directors.

At the annual meeting of the Citizens' Telephone Company, of Manchester, N. H., the following officers were elected: President, John B. Hall; clerk, Harry P. Ray; treasurer, G. A. Leighton; directors, John B. Hall, G. A. Leighton, Harry P. Ray, George E. Richards and E. R. Whiting.

At the annual meeting of the stockholders of the Northwestern Telephone Exchange Company, of Minneapolis, Minn., the old board of officers was re-elected. The capital stock of the company was increased by $1,000,000. The toll line system of the company will be extended to all the principal cities and towns in Minnesota, North and South Dakota.

The American Telephone and Telegraph Company, with western headquarters at Chicago, has succeeded in getting the right of way through all the principal counties and cities of southern Illinois, and now has a force of 300 men at work erecting its lines. The main line will extend from St. Louis to Evansville, Ind., and will have direct connection with Chicago and New York. The long-distance wires between St. Louis, Mount Vernon and Mascoutah have already been strung.

The Edison Manufacturing Company's New Quarters in New York City.

Upper Broadway has no finer modern office building than the St. James, at the corner of Twenty-sixth street. Its 16 stories tower above everything in the neighborhood.

FIG. 1.—EXTERIOR VIEW OF THE EDISON MANUFACTURING COMPANY'S NEW STORE, ST. JAMES BUILDING, NEW YORK CITY.

The ground floor corner store is shown in the illustration on this page, and gives one an idea of the pleasing architectural effects which make this building and store a landmark in the uptown shopping district. The facades on both Broadway and Twenty-sixth street are of light sandstone and red brick, similar to the new downtown Singer Building, corner of Liberty street and Broadway.

The store itself has a floor space of some 5,000 square feet. Over the front entrance is a graceful glass awning, which, together with the broad show-windows, makes the lighting as nearly perfect as possible. At night the illumination of the store is a flood of radiance, as befits the company headquarters of Thomas A. Edison.

His well known signature is executed on the dark background of the signs over the doors in miniature incandescent lamps. Nothing could be more attractive than the exterior, and nothing more satisfactory than the interior. The store is high and broad and long. Down the center is a row of massive gilded columns. The walls are done in Pompeiian red. The ceiling and cornices are of antique ivory finish. Fittings of polished oak with frosted glass doors and partitions separate the spacious offices from the main room. The hardwood floors are carpeted with broad strips of Axminster, giving an air of luxury and elegance usually found in boudoir or drawing-room, and not looked for in a showroom.

Downstairs the basement is as roomy as the store itself. Under the sidewalks are the wrapping and packing-rooms, as well as the adjusting and testing departments. There are a number of small rooms fitted up cosily, where buyers of records for their phonographs may hear them undisturbed. A stock of 15,000 records makes buying easy; you can always get just what you want. There is also in the basement a fine "darkroom," 50 feet long, permitting the proper display of moving picture films for the projecting kinetoscope. A special showroom is provided for X-ray demonstrations, where the wonders of the cathode ray are exhibited, together with all the special apparatus used.

It is worthy of note that the goods displayed do not suffer by reason of their gorgeous setting; for their excellence, perfect finish and high grade warrant every penny of expenditure in making this room one of the most attractive salesrooms on Broadway. The entire line of Edison phonographs is exhibited, from the most complete and costly down to the popular-priced latest invention, the "Standard." Edison fans of various styles and sizes make the hottest, closest day seem like a seashore idyl. All types of the effective Edison–Lalande batteries are shown, while dental motors and a most complete line of electro-medical apparatus are the envy of every doctor or dentist who visits the store to see the very latest developments in the art.

A corps of polite and attentive salesmen are always ready to explain and demonstrate, or to use their arts of persuasion on customers who come prepared to be separated from their money in lawful and profitable *quid pro quo*. Whether buying or looking around, all are welcome, and a visit to this store will be reckoned before long as one of the sights of the metropolis.

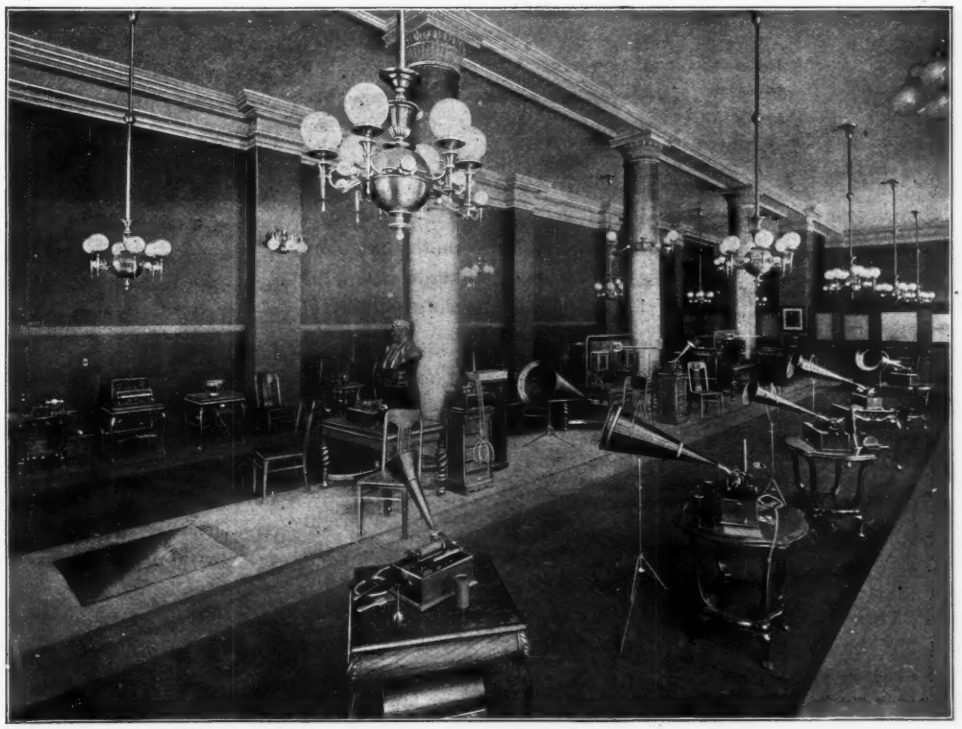


FIG. 2.—INTERIOR VIEW OF THE EDISON MANUFACTURING COMPANY'S NEW STORE, ST. JAMES BUILDING, NEW YORK CITY.

Professor Roentgen, of Würzburg, has been awarded the Elliot-Cresson medal of the Franklin Institute of Philadelphia.

Electrical Review

[OLDEST ELECTRICAL WEEKLY IN THE UNITED STATES.]
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STEPHEN L. COLES, - - ASSOCIATE EDITOR.
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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue. NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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Mr. Philip D. Armour has just added $500,000 to the $1,000,000 he had previously given to the Armour Institute of Technology at Chicago. There are now 1,100 students at the institute, which maintains an excellent course in electrical engineering. Mr. Armour has made the best investment possible to the man of great wealth.

The subscribers to the ELECTRICAL REVIEW will receive with this issue a complete and well arranged index of volume 32. We would respectfully suggest that these be preserved by all who file this journal, for we can not agree to supply additional ones.

Under the supervision of General Greely, the signal corps of the army has performed many meritorious services in cable-cutting exploits along the coast of Cuba. One of the most important things done by the signal corps was the re-establishing of cable communication between General Shafter's army and Washington. A cable station is now in full operation at Playa del Este, and the President and Secretary of War at Washington can communicate rapidly with General Shafter, who is in charge of the Santiago expedition.

In a note communicated to the Paris, France, Academié des Sciences, M. H. Couriot suggests that the X rays may prove as efficient in showing the intimate structure or silicious skeleton of our coals as they are in defining the calcareous skeletons of animals. He states that by means of a powerful Crookes tube and a fluorescent screen it is easy to determine the purity of a fuel, as carbon in all its forms is exceedingly transparent to the rays, while silica and silicates are opaque, and on placing a lump of coal between the tube and screen all the intimate details of the slag and clinker, forming portions of the fuel, at once appear. M. Couriot has tested in this way anthracite coal, lignite, peat, coke and block fuel. The finest particles of silicate, though quite invisible to the eye, show up at once on the screen as dark spots or bands on a bright ground, and the difference in the quality of a series of coals can be traced step by step, showing at once the variations in the purity of the fuel. M. Couriot has taken radiographs with specimens up to two inches thick, the coil used having a spark 10 inches long and the exposure being five minutes. This is interesting work in another field of usefulness for the marvelous X ray.

ELECTRIC CABS IN NEW YORK CITY.

The general public, as well as electricians and financiers, have been watching with interest the development of the electric livery service established in New York city a few months ago by the Electric Vehicle Company. Leaving aside the political and municipal questions involving a public cab service in a city as large as New York, there were several vital points to be overcome, experimentally, before a positive answer could be given as to whether or not an electric cab service would be financially successful.

The first point to be attained was that the operating cost of an electric vehicle should be below that of a vehicle drawn by a horse. The fact that this has been accomplished in street railway traction left no doubt to those in charge of the matter that it could also be done with other electric vehicles. As several types of electric carriages have been used in New York, and as the whole scheme is of very recent origin, exact figures as to the earning powers of any particular style of electric vehicle are unavailable at the present time.

There is no doubt that electric cabs are perfectly practicable, but the construction of such vehicles being relatively new, there is, of course, a great field for their improvement. Such a vehicle has to be built exactly according to the requirements it will have to meet. Certainly the public cab and livery service in New York is about as severe a test as could be devised for any kind of vehicle.

The ELECTRICAL REVIEW understands that the company now operating the electric cab service in New York has achieved results which are very encouraging. This is emphasized by the fact that the company is now completing 100 new electric carriages, which will be put in operation as speedily as possible. It is probable that a year hence some very interesting and valuable facts and figures regarding electric vehicles will be available.

Three cheers for Sampson and his gallant men!

ADDRESS OF PROFESSOR FUJIOKA.

HIS REMARKS BEFORE THE NORTHWESTERN ELECTRICAL ASSOCIATION, AT DULUTH, JUNE 14.

Professor Fujioka: I am not going to deliver an address here, and I will illustrate the reason. If you partly fill a bottle with some liquid, and then add another liquid of greater specific gravity, the lighter liquid will rise and the heavy liquid remains at the bottom. I was intending to give you a short account of what has been going on in Japan in the way of technical education, particularly electrical engineering, but I have seen so many interesting things and have got so much useful information on this trip, that the things which occupied my brain have been crowded out. But I must take this opportunity to express my thanks for the courtesy extended to me by the Mayor of the city and the president and members of this association. I have never had such a pleasant time in my life as I have had on this occasion, coming from Chicago to Duluth. I have long been anxious to taste the delights of a trip on the Great Lakes on board a palace steamer, and I have long heard of and wished to see those masterpieces of engineering skill, the locks at Sault Ste. Marie. My wishes have been gratified and the realization surpassed the expectation. What great locks they must be, to admit the steamer "Northwest." I believe they are the largest in the world. When going through these locks I was reminded of the time when I crossed the Suez canal some years ago. But I was more pleased with the Sault canals with the fringe of green trees on either side. I was pleased, too, to see such gigantic land engines as we examined in the copper mines yesterday. I was particularly interested, too, in the great shafts going down a mile or more perpendicularly into the earth. It is of particular interest to me, as I have done some experimenting in underground temperature, and these shafts are the deepest in the world, I believe. The Japanese Government is now expending a large sum of money in digging a special shaft to investigate the earthquake question. Japan, as you know, is frequently visited by serious earthquakes, destroying many lives, and our House of Commons has passed a law to spend a certain sum of money each year in making special investigations regarding earthquakes. I would like very much to go again to the copper fields here, with special instruments, to investigate the subject of the underground temperature.

I might take this opportunity to say a few words about lightning, which is the topic of this morning's meeting. We use to run barbed wires all through on the pole lines in the Edison three-wire system, and we had not a single instance of damage done by lightning, although our country is very often visited by thunder-storms of great energy. Thus

far many of the so-called lightning arresters have failed to give good satisfaction in Japan, and I perfectly agree with Mr. Wurts as to the way in which the long-distance transmission line should be protected.

I can only thank you for the kindness with which you have treated me, and I am very glad indeed to be associated with such a distinguished gentleman as Professor Gray, as well as with such energetic gentlemen as the members of this association.

I wish to add a word regarding the feeling in Japan towards America. It is quite friendly, and, in my opinion, the development of the electrical engineering industry in general is mainly due to the efforts of American inventors and engineers. (Applause.) We are using Morse instruments almost exclusively on telegraph lines in Japan, and we use Western Electric switchboards on all telephone exchanges, and Edison and Brush machines in lighting. That shows that the so-called alliance of the United States, Great Britain and Japan is already accomplished, as far as electricity is concerned. (Applause.)

An Electrical Outing.

An organization known as "The Syndicate," of which the following electrical gentlemen are officials, announces a public meeting at Reading, Pa., Saturday, July 16: Mr. C. A. Bragg, president; Mr. John Graham, vice-president; Mr. J. A. Rigg, secretary; Mr. E. W. Ash, treasurer, and Mr. Alvin Markle, chairman executive committee. The festivities of this meeting are to continue the greater part of the day and through as much of the evening as the participants can stand. The meeting will be under the auspices and hospitality of Mr. John A. Rigg, president of the United Traction Company, of Reading, Pa. Root beer and pretzels are the chief viands, and prizes are offered for the winner of the most games, and each recipient is compelled to carry the prize home with him, which makes the matter serious. All are sure that they will be taken care of at the meeting, whether able to return home or not. The editor of the ELECTRICAL REVIEW acknowledges an invitation through the courtesy of the Syndicate's president, and regrets that time and distance are insuperable.

OBITUARY.

Death of Edwin H. Bennett.

Edwin H. Bennett, who for many years was interested in the manufacture of sewing machines, died on June 27, at the Plaza Hotel, New York city, where he lived with his family. Mr. Bennett was president of the Babcock & Wilcox Company and treasurer of the Singer Manufacturing Company. He was the inventor of many devices used in the manufacture of sewing machines. He leaves a widow, two daughters and a son, E. H. Bennett, Jr., president of the Diehl Manufacturing Company, of Elizabethport, N. J.

Mr. Charles W. McDaniel, general superintendent of the Missouri & Kansas Telephone Company, Kansas City, Mo., will have the sympathy of his many friends over the death of his wife, which occurred Sunday morning, June 26. The funeral was held on Tuesday. Mrs. McDaniel had been an invalid for over a year.

Speed Control of the Sprague Elevator.

The accurate operation of the mechanism for preventing the Sprague electric elevators from getting beyond control was well illustrated a few days ago, when one of the express elevators in the building 20 Broad street, New York, was held after a fall of a few feet. A little oil had gotten on the brake band and noncircuited the lever. The car started to fall, but, before the elevator had reached the speed limit, the safety clutch became engaged and prevented the drop. In the construction of the Sprague elevator the possible speed is geared up to a certain limit. In the Cable Building installation the limit is about 650 feet a minute, which is considerably under the degree of speed at which it is safe for an elevator to go. When this speed is attained the operating motor automatically shuts off, stopping the elevator, but before this limit can be reached the safety clutch operates, thus making a second independent check for the car, should either fail to work.

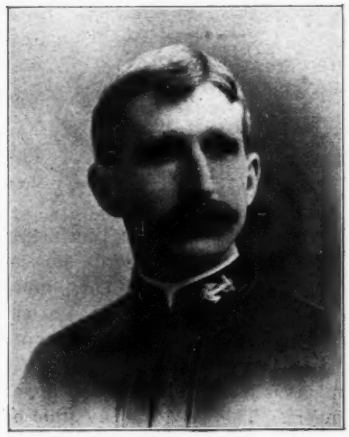
The New York Telephone Company, under date of June 29, issued the following special notice to all pay stations:

On and after July 1, 1898, the charge for a telephone message from any public telephone pay station in the Borough of Manhattan to any other telephone station connected with an exchange of the New York Telephone Company in the same borough will be 10 cents, instead of 15 cents, as heretofore. The charge for a message from any station in the Borough of Manhattan to a station connected with an exchange of the New York Telephone Company in the Borough of the Bronx will be 20 cents, instead of 25 cents, as heretofore.

Another Electrical Engineer Receives a Naval Appointment.

Mr. George Breed, whose portrait appears on this page, was appointed from Covington, Ky., by John G. Carlisle, to the Naval Academy, from which he graduated with honors in 1886, second in his class. From 1886 to 1889 he made a cruise on the "Atlanta," and was connected with the Washington Navy Yard, and as Inspector of Ordnance at West Point foundry. He subsequently made a short cruise on the "Baltimore."

Soon after this he resigned from the navy to enter the electrical field. For two years he was with the Sprague Electric Company at Pittsburgh. He then became electrical engineer for



LIEUT. GEORGE BREED, WHO RETURNS TO THE NAVY FROM THE ELECTRICAL FIELD.

the Pennsylvania Iron Works, and later entered the Philadelphia office of the Westinghouse Electric and Manufacturing Company, where he acquitted himself with great credit as an engineer and representative of this well known company.

During the last four years he has been a very prominent and active factor in the Pennsylvania Naval Reserve. Recently Mr. Breed received an appointment in the navy, after a very creditable examination at Washington, to the rank of lieutenant, junior grade. He has been ordered to the "Minneapolis." The electrical field will lose, temporarily, in Mr. Breed a very bright, charming and congenial companion, and one highly posted in the field of electricity.

Mr. Breed married the daughter of the late Admiral Meade.

A copy of the Cincinnati Bell Telephone Directory, No. 32, July, 1898, has been received at the ELECTRICAL REVIEW office, through the thoughtfulness of Capt. Geo. N. Stone, general manager. The directory is very complete and conveniently arranged.

PERSONAL.

Mr. H. W. Dexter, of Caracas, who is interested in electrical work in Venezuela, is visiting New York city.

Mr. A. C. Garrison, of the Columbia Incandescent Lamp Company, St. Louis, visited New York city last week.

Mr. Samuel Insull, president of the Chicago Edison Company, is spending a few days in New York, a guest of Delmonico's.

Mr. James F. Cummings, of the Armorite Interior Conduit Company, was in New York city several days last week.

Mr. Charles H. True has been elected a fellow in electrical engineering at the University of Nebraska for the collegiate year 1898–9.

Mr. William F. Osborne, for many years connected with electrical journalism and now with the *National Provisioner*, was married on June 20 to Miss Emma Catharine Gale, of Brooklyn, N. Y. The ELECTRICAL REVIEW extends its heartiest congratulations.

Mr. John A. Brill will be unable to serve as a director in the General Electric Automobile Company, as was announced at the starting of that organization. The business of the J. G. Brill Company is so heavy that it requires all Mr. Brill's time and attention in looking after its extensive affairs.

Mr. Frank Ellmaker, general superintendent of the North Jersey Street Railway Company, which controls almost all the trolley lines in northern New Jersey, has resigned on account of ill health, and the vacancy has been filled by the appointment of Mr. George Chapman, who was superintendent of the Elizabeth division.

Lieut. E. J. Spencer, of St. Louis, has been nominated to the lieutenant-colonelcy of the Third Regiment of Volunteer Engineers by President McKinley. Lieutenant Spencer is an ex-officer of the regular army, was formerly connected with the General Electric Company, and of late has represented the interests in the West of the Safety Insulated Wire and Cable Company, of New York.

W. K. Freeman Out of Jail.

Walter K. Freeman, the electrical engineer who has been in prison three years, during which time he has been fighting continuously for his liberty, was released from the Tombs last week by Supreme Court Justice Fursman. Freeman was indicted for assault. He was convicted and sentenced to 10 years' imprisonment.

A New Street Railway Motor.

The General Electric Company announces the development of a railway motor especially adapted for medium heavy railway work, under the designation of the G. E. 51-B. It is the outcome of a series of exhaustive tests on cars and locomotives with heavy trains propelled by electric motors on steam train schedules, and the complete and reliable data thus obtained have been used to determine the best form of construction necessary to meet the requirements. Heavy railway motors of General Electric manufacture have already replaced steam locomotives on both elevated and surface roads, the change invariably resulting in higher speed and greater capacity. Our readers are familiar with the installations of the General Electric Company for the Baltimore & Ohio tunnel, the Nantasket Beach and the Hartford, New Britain and Berlin lines of the New York, New Haven & Hartford Railroad. For moderately heavy service, such as that required on the Cleveland, Painesville & Eastern Railway and the Lorain & Cleveland Railway, General Electric motors have also been especially successful. The data obtained from these installations added to those obtained by experiment have formed the basis for the development of the G. E. 51-B.

This motor has been especially designed for high-speed suburban and elevated railway work. It has a capacity of 80 horse-power, based on a rating of 75 degrees centigrade rise in temperature of the windings above that of the surrounding atmosphere after one hour's run at rated load. A double G. E. 51-B motor equipment with the gear ratio of 2.27 will propel a loaded 20-ton car at a maximum speed of 26 miles per hour on a level track. Higher or lower gear ratios may be used for different speeds; that is, with the speed reduced one-half, the motors will handle a car or train twice the weight.

The frame of the G. E. 51-B is of cast-steel, made in two bowl-shaped halves bolted together. It completely protects the working parts of the motor from mechanical injury and the action of water or dust. The upper casting has a large opening to allow of the inspection of the commutator and brush-holders and the replacement of the brushes. This is covered with a dust-proof cover plate easily removed by turning a cam-locking device. A hand-hole, also fitted with a weatherproof cover plate let into the lower frame at the commutator end, facilitates the removal of any foreign substance in the bottom of the motor.

The motor has four laminated pole-pieces with projections supporting the coils, which are slipped over them. They are secured by bolts passing through the frame and fastened with nuts on the outside.

FIG. 1.—G. E. 51-B RAILWAY MOTOR, FRONT END.

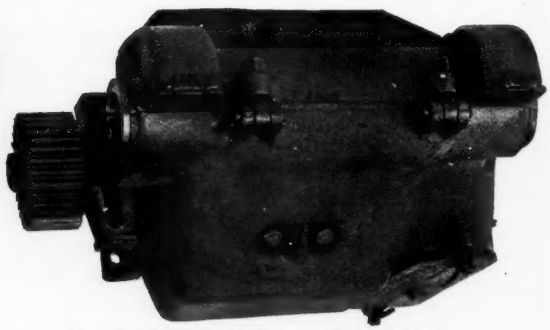


FIG. 2.—G. E. 51-B RAILWAY MOTOR, REAR.

The bearings have been given ample proportions, to insure good lubrication and long life. The upper support of the linings of the armature bearing is part of the upper half of the motor frame; the lower support is a cap bolted to the upper support. The armature can thus be held in the upper half of the motor, while the lower half only is lowered. To remove the armature it may be lowered with the lower half. The cored recess between the inner ends of the lining and the motor frame is occupied by a combination thrust collar and oil guard, an open space at the bottom being left to give free outlet to oil or grease. With this construction it is impossible for oil or grease to work its way into the motor or come into contact with the windings. The upper supports of the linings are provided with large grease boxes, and the lower are cored, leaving a recess for the oil. Felt wicks or wipers come in contact with the shaft through openings in the lining, and convey a continuous supply of oil to it. The linings of the armature bearings are cylindrical in form, made of cast-iron and babbitted, and are held in place by dowels in the lower support. The axle bearing linings are held in place by the upper and lower halves of the frame, extending back and enveloping the car axle. They are made of composite bearing metal, lubricated by oily waste held in an oil well and pressed against the outside of the axle by a leaf spring. The dimensions of the armature bearing are—commutator end, six and three-fourths by three inches; pinion end, nine and one-half by three and one-fourth inches. The axle bearings are nine inches long, with diameter corresponding to the size of the axle.

The field coils are of copper ribbon wound on metal spools and insulated between turns with asbestos. The coils are thoroughly insulated from the spools with specially prepared mica, canvas cloth and press-board. After the windings are in place, the canvas is brought over and sewed, completely enclosing and protecting the coil. The whole is then given a heavy coating of weatherproof insulating compound.

For convenience in car wiring, and to facilitate opening of the motors, the connections between the upper and lower fields are made on the outside of the motor, and both field and armature leads are brought out at the front.

The armature is of the iron-clad, hollow core type, 16 inches in diameter and 10½ inches long. The core is built up of well annealed laminations provided with ventilating ducts, as in the armature of the G. E. railway generators, the laminations being assembled directly on the shaft and not on a separate spider. The core has 37 slots, each slot containing three insulated coils laid together in one compact unit. This gives the armature 37 sets of coils with 111 leads, corresponding to the number of bars in the commutator. All coils are formed and insulated before application to the core, the small number facilitating repairs, while the method of grouping them permits the use of substantial insulation. This is of the highest grade, and shipment of armatures poorly insulated is prevented by giving each a thorough test with 2,500 volts alternating.

The pinion is made of cast-steel with machine-cut teeth, and bored for a taper fit on the armature shaft. Both gears and pinions are made at the General Electric Company's gear plant at Lynn.

The commutator is 11⅝ inches in diameter, with 111 segments built up with alternating layers of mica insulation and securely clamped on a malleable iron shell. The segments are of the best hard-drawn copper, 6⅛ inches long, with a wearing depth of one inch. The mica cone insulations used in assembling the commutator are built up and compressed into moulds, making them hard and compact, and the mica between the segments is especially selected with a view of giving it a degree of hardness that will make it wear evenly with the copper segments.

To insure perfect insulation every commutator is tested with 500 volts direct current between adjacent segments, and 5,000 volts alternating between the segments and the shell.

The brush-holders are of cast-brass, and each is arranged to hold two carbon brushes, which slide in finished ways and are pressed against the commutator by independent pressure fingers, giving a uniform pressure throughout the whole working length of the brushes. The brush-holders are offset one-quarter of an inch to prevent the wearing of grooves in the commutator, and are clamped to a well seasoned hardwood yoke filled with moisture-proof compound bolted to the top magnet frame and easily removable through the opening over the commutator.

Mounted on 33-inch wheels, the clearance between the bottom of the frame and rails is three inches. That between the bottom of the gear case and rail is four inches.

PUBLIC LIGHTING IN RELATION TO PUBLIC OWNERSHIP AND OPERATION.

READ BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, CHICAGO, JUNE 8, 1898, BY ALEX. DOW.

This paper is written to set before the association a proposed policy. It is not a new policy in its parts, neither is it an untried policy. It is applicable immediately to public lighting; that is to say, to the lighting of streets and public places under contract with, or on account of, a municipality. Ultimately its application may be more extensive.

It is the belief of many members that the National Electric Light Association should formulate and publish a well-considered method of dealing with this business. While local conditions differ, there is no local difference in the principles which should govern electric lighting companies in their dealings with municipalities and municipalities in their dealings with electric lighting companies. An authoritative statement of these principles is needed. A statement by the association may be accepted in the first place only by the electric lighting companies, but if the principles so stated are intrinsically correct, their acceptance by the municipalities must follow. No city government will persist in a course that is plainly inequitable. City governments have in certain cases acted inequitably in the matter of public lighting, but their action has not been plainly inequitable. In such cases principles have been obscured by details or by personalties or have been but distinctly understood by the parties on both sides of the case. The public does not seek to be served at the expense of the individual. Public opinion may at times be biased, but it intends and endeavors to be just. And under our scheme of government public opinion is the final authority; and an appeal to public opinion is the ultimate means of redress for any grievance.

The advocates of municipal ownership have long recognized the value of public opinion, and have presented their case both to the people of the country at large and to the citizens of selected municipalities through magazine articles, newspaper discussions and addresses to public gatherings. Some of our members have met these arguments in kind and have confuted extravagant statements by the presentation of facts. But the man who is plainly arguing in his own interest is handicapped in a debate before a non-judicial tribunal as against those who claim to be disinterested. And it is not to be denied that the arguments which have had most influence on public opinion in this matter are those of theorists who certainly believe that they are doing the world a service, who are usually misinformed, always impracticable, but thoroughly in earnest.

A declaration of principles by this association and the recommendation to its members of a policy based on those principles would have greater weight with the public than the statements of individual companies, and would be accepted as authoritative over a wider area But even if not accepted by the public its immediate acceptance by our own members will be useful. That each member must act for himself is a consequence of the conditions of our business, but that all should act on similar lines is possible and is desirable. Each of us looks to other cities than his own for light on problems which are new to him. Each of us, by a successful solution of any problem, benefits the industry at large, and, on the other hand, he who fails to appreciate and to properly deal with such a problem as this, injures, by his failure, not only himself, but all of us. Therefore, it is well that we should agree on general principles, and that we should advise with one another on special cases.

Let me make this general statement more specific. The member of this association who, by good service, by close figuring of expenses and of profits, and by clear statements and logical arguments, convinces the authorities of his own city that it is to their interest to leave their public lighting in his care, has done all of us a service. The member who, on the other hand, fails to recognize the drift of opinion among his fellow citizens, who tries to convince them that unsteady and uncertain lights are worth a high price, who depends for the retention of his city lighting contract on an appeal to the technicalities of his state law, or to the pockets of the venal members of his local board of aldermen, and who thereby brings about the erection of a municipally owned electric lighting plant and the publication of the bare running costs of that plant in parallel columns to the prices which he wished to charge—the member who does these things which he ought not to do, and leaves undone those other things which he ought to have done, is a detriment to the industry throughout the entire Union.

I have indicated why I believe a declaration of principles and of policy is desirable. The principles to be declared will need little discussion, but the policy which to me appears best, may, when examined by others, appear to require amendment, or even radical change. It is offered to you for consideration in the belief that it is logical and that it is practical; but as a proposition for discussion and amendment, rather than as a perfected plan.

In the history of street lighting by electricity no chapter contains more profitable matter for study or for illustration of general principles than that which contains the record of the city of Detroit. That city was one of the first to use electric lights on its streets. It began in 1883 with 22 arcs, and in 1884 abandoned all other street lights. This street lighting business was believed by those who first engaged in it to be a monopoly secured by patent rights; they found their mistake after much money had been invested under that belief; competition ensued; then consolidation, and finally municipalization of the service. I shall find it convenient to refer to Detroit for more than one modern instance.

In February, 1896, the city of Detroit owned 1,500 arc lamps and was operating 1,492 of these in the work of street lighting. In the same month the successor of the Brush Electric Light Company, which installed the original 22 lamps in 1883, and which, until 1890, lighted the streets under contract, owned 1,049 arc lamps, and used in private lighting 433 of that number. Another company, organized in 1890 to compete with the Brush Electric Light Company, owned 1,330 arc lamps and was using in private lighting 38 of these. In each case there accompanied the arc lamps a sufficient number of dynamos, engines, boilers, etc., and a building fully equipped for the operation of the number of lamps stated. At the same time the city had in use 134 towers, which has been formerly owned by the Brush company, and the other company was in the act of taking down and removing from the streets 104 similar towers, which had formed a duplicate of the Brush company's equipment. The necessary lines to connect lamps distributed over a large city had been owned by all three. The city had in use 329 miles of overhead wires, connecting to its 1,492 lamps. Neither of the companies had owned such a great mileage of line, but one had taken down lines and poles which had supplied 719 lamps, and the other was in the act of removing lines and poles which had connected in 1,279 lamps.

Some of the Brush company's street lighting equipment had been during the preceding five years diverted to the supply of commercial lights. Nevertheless, two-thirds of that equipment is to the present day a useless asset. Lamps which were bought at $40 have proved impossible of sale at one-tenth of the price. Dynamos which cost $2,400 can not be sold to-day for $240. Lines taken down returned only a small percentage of their cost to the treasury. The towers which this company sold to the city did not bring their original price—that goes without saying—but they brought a fair price.

The loss of the second company was greater. Changes in the business had made their street lighting arc lamps unavailable for commercial use, or almost entirely so. Similar changes had made their dynamos a slow asset. The engines were partially diverted into commercial service, and the boilers entirely so. The wire taken down was not of a size that would fit in to their commercial lighting system, and the poles hardly paid for the labor required for their removal. The 104 towers—one of the heaviest of all the original expenses—had to be sold as scrap iron.

It is clear that a loss to some per-

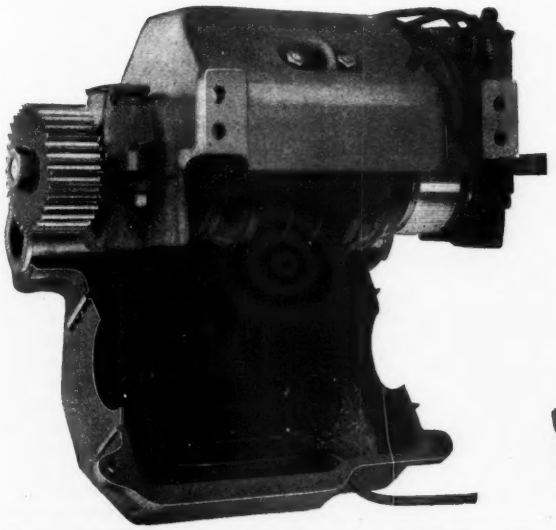


FIG. 3.—G. E. 51-B RAILWAY MOTOR, LOWER FRAME DROPPED, ARMATURE IN POSITION.

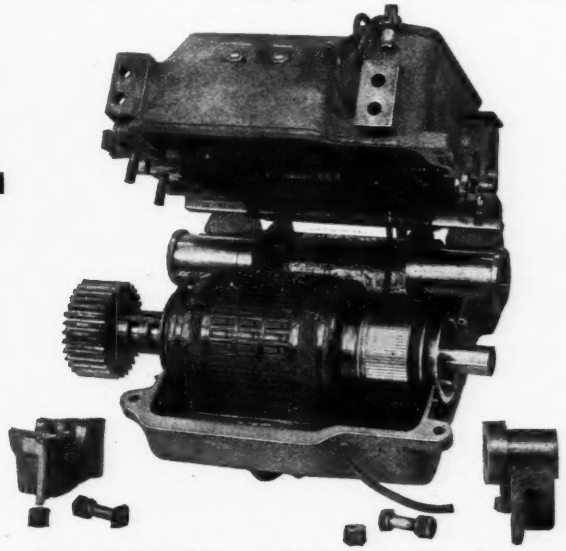


FIG. 4.—G. E. 51-B RAILWAY MOTOR, LOWER FRAME DROPPED, ARMATURE READY FOR REMOVAL.

son or persons was involved in conditions which reduced machinery and lines capable of supplying over 2,000 arc lamps to approximately their junk value. Leaving out all questions as to personal fault—neither affirming nor denying that the loss fell upon those for whose economic blunders it was the inevitable punishment—it is certain that there was a loss to the community at large; that property which might have been and which had been capable of doing good service to the public, was as surely destroyed as if it had been swept out of existence in a great fire.

It may be asked on whom did the loss fall? In social economy the loss of one is the loss of all, but to our customary modes of thought there appears a difference between losses borne by ourselves immediately and those which are apparently borne by other people. In this case the greater part of the loss was borne by business men of the city of Detroit. It was a reduction of the available capital of men engaged in productive industry in the city. This reduction—this absolute loss—after correcting for inflated values which should have been written off long before the period of liquidation; after correcting for securities issued for cash at less than their face value, or for considerations which were valued at more than their true worth, was not much less than $400,000.

I do not ask you to sympathize with the immediate losers, but I ask you to remember as my argument proceeds that this loss came about in consequence of business methods and of social tendencies which are in active operation to-day in nearly every town represented in this association. And I submit as a principle not admitting of dispute, that the duplication of an effective equipment for public lighting is an economic error, entailing loss of available capital to the extent of the duplication.

The first error in Detroit was the offer to the city of competition for the public lighting contract. The men who made the offer knew perfectly that their success would mean a heavy loss to the original contractors, but they were willing to make a profit through other people's losses. In this they disregarded a principle much older than the electric lighting business—that which calls on us to do to others as we would that others should do to us. Some of these men doubtless thought that they were doing the city a service by providing competition, but the managers of the manufacturing concern which was the majority stockholder and chief promoter in the new organization had no such excuse. Their object was to sell machinery. I do not ask you to condemn these people now. They have reaped as they sowed, and the exploitation of competing lighting companies by manufacturing concerns is a thing of the past, although its consequences in the shape of inflated capital are likely to be a burden for years to come.

I submit as a direct application of the principle last stated, that competition for public lighting contracts, for the execution of which there is already an effective equipment in existence, is not legitimate business. The corollary of this statement is that the price at which public lighting is to be performed must be determined by some acceptable means other than competitive bidding. In this there is a departure from the established method of municipalities, which now depend on competition for the setting of prices on all public services performed by contract.

In the absence of some other acceptable means of setting a proper price for public lighting by contract, public opinion will not tolerate the suppression of competition. A reference to Detroit illustrates this very well. When the second company had, by making a lower price and by meeting the demand of the public for the undergrounding of wires in the business district, secured a three-year contract for public lighting, its managers found themselves in a precarious position. It was apparent that at the term of the contract they would again have to reduce prices to meet the competition of the original contractor, who could not afford to have his plant standing idle. It was also immediately apparent that the idle plant would be, as far as possible, diverted into private lighting work, and would there also tend to reduce prices and to divide the available business. Legal questions as to patent rights added to the difficulty of the situation. An attempt to combine the two interests was plainly necessary, and it was made; but the inevitable personal soreness prevented a combination until the new company had completely duplicated the equipment of the old one.

Of course the public became advised of the cessations of competition, and the advocates of municipal ownership made the most of the facts and added much fiction. Long before the contract had expired it was plain to any careful observer that it could not be renewed at anything like the former figure, and that the tendency of public opinion was strongly to municipal ownership. It was a period of "reform"—I use the word in its political sense—one of those periods when the taxpayers, usually content to be bossed unquestionably by the practical politicians, insist on calling the particular bosses of the hour to an accounting and expect to find that they are rascals. And as the public's way of having an accounting is to discharge its servant first and take up the reckoning afterward, the public servants of such periods are quick to fall in with the drift of public opinion in order to show that they either do not deserve discharge or are fully justifying their appointment to their new situations. Politicians are wise at such times; lighting companies sometimes are very foolish.

So the cry went up that there was no such thing as competition in the lighting business; that the men engaged in that business all intended to rob the public, and that if they appeared at times to compete with one another, it was only a temporary falling out among rogues. And the public being told on the one hand that all existing lighting companies were composed of rascals, and on the other that all municipally owned plants were successes, made up its mind that its only salvation lay in municipal ownership.

You can see, and any careful student can see, that the suppression of competition was inevitable, because its continuation meant a cumulative loss to those engaged in it. Possibly the public might have been made to see this, although the time to have begun work on the public was before the first loss due to competition had been incurred. But to merely prove that competition was impossible would not have been enough. It must further be proved that competition was unnecessary, and the only way to do that was to offer good service at an acceptable price. Under the circumstances the price might have to be very low indeed, for the belief was abroad that the business was enormously profitable at the established rates. The figures sent forth by certain municipal plants were quoted as warranting this belief, but these could have been contradicted. It was possible to send to Bay City and to Topeka a competent engineer—say one of the professors of the University of Michigan—whose dictum would be accepted by the newspapers and their readers; and so to obtain the true figures. It was possible to answer in a similar manner the argument based on the competing bid at the last letting of the contract. That argument was that any business which justified the erection of a complete manufacturing plant on the security of a three-year contract must be exceedingly profitable. The contract price was a good one, but it would not pay for the plant in three years, as the public of Detroit thought it would. A showing of the whole truth as to costs, certified by a recognized authority, and followed by a bid carrying a minimum profit, might have been accepted by the public as a substitute for competition.

And here was made the second great error of the electric light companies. Their managers seem to have been the only people who did not see what was coming. They failed to keep in touch with their public. The public was absorbing all the fool figures that the wildest theorists could furnish, but never a figure deserving credence was offered in contradiction. The public was damning the poor quality of the lights when furnished, and was told that it did not know a good light when it saw it. The public was determined to have much cheaper lighting, yet when bids were asked for they were almost as far above a possible figure as the costs published by the theorists were below it. The only hope for the contractors was to secure the support of the more conservative elements by offering good light at a minimum rate. On their failure to do this, and do it quickly and gracefully, municipal ownership was certain.

(To be continued.)

The Victor Telephone Manufacturing Company, Chicago.

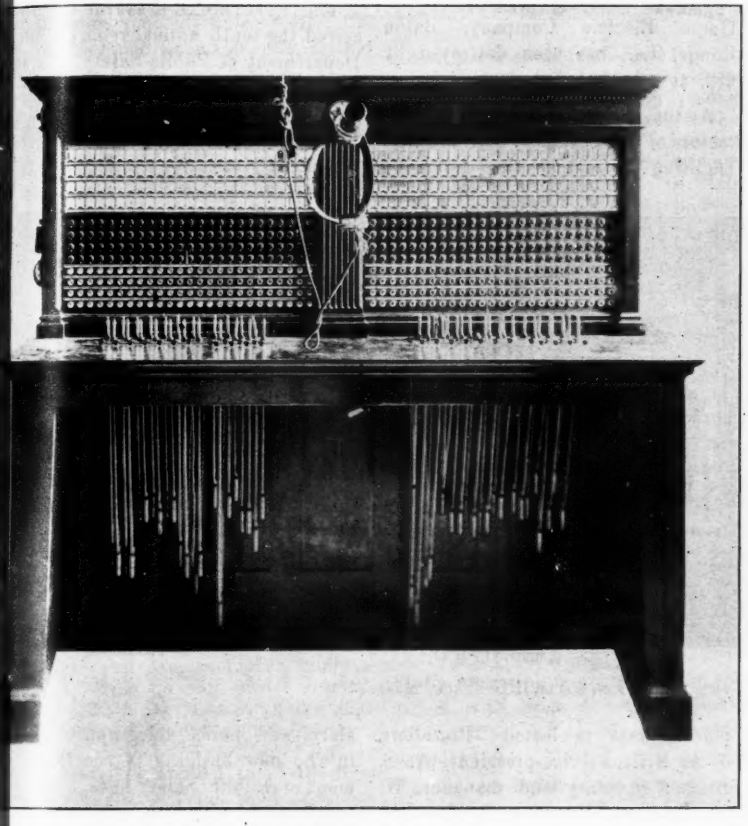
If the impression the Victor Telephone Manufacturing Company made upon the public on the occasion of its début, during the second annual convention of the Independent Telephone Association, can be taken as an indication of its future popularity and success, the name "Victor" was well chosen indeed. Entering the field of independent telephone manufacture at this time, unhampered by old-time ideas and inefficient designs, but backed by more than ample capital and having at its command the most advanced ideas of modern telephone engineering, coupled with the services of the best electrical and mechanical skill, would make the success of the company a foregone conclusion.

In bringing to completion the final organization of the Victor company, its members realized that, in order to successfully cater to the more and more exacting demands of a discriminating telephone public, it would be necessary to not merely furnish apparatus of the latest and most efficient design and construction, but to also furnish it at a price that would not make its adoption prohibitive. In the recently equipped factory at 166-174 Clinton street can be found the most complete line of modern machinery ever designed for the production of high-grade telephones and central exchange apparatus. A 3,000-line switchboard can be turned out with equal facility as a 16-drop table, and an order for a complete exchange equipment of almost any size will be filled as promptly as a demand for a sample private line apparatus. To give in detail a description of all the various types of apparatus made by the Victor company is not within the scope of this article, the intention being to merely give an outline of the principal items of manufacture.

The Victor switchboard, as already stated, is built in sizes of from 16 to 3,000 drops or larger, either of the common return or metallic circuit type, and embodies features of merit and design not found in many other types. The cut gives a good idea of the general appearance of the board, the illustration showing one of 200 lines capacity. The Victor long-distance arm and transmitter is undoubtedly one of the neatest devices of that kind ever placed on the market. It has a 500-ohm coil, carefully wound in layers, separated by oiled paper, and its transmitting qualities make it equally efficient on the longest or shortest lines. Binding posts are provided for all connections, which makes it especially adaptable in changing from less efficient forms. The Victor double-pole receiver was fully described in the ELECTRICAL REVIEW of January 5 last, and since that time a test of a number of them under the most exacting conditions has demonstrated their absolute superiority. Other products of the company, such as cross-connecting boards, cable heads,

lightning arresters, transfer boards, in fact all the numerous devices entering into the construction of either an exchange, long distance or private line, are of the same high quality and efficiency for which the "Victor" apparatus has already become known.

Mr. Wm. T. Blaine is the general manager of the company, and the energetic and forcible manner in which he has taken hold of the business end of the company augurs well for its success. Mr. E. E. Yaxley, the general superintendent, has been actively engaged in the telephone field for over a decade, and it is mainly due to his intimate knowledge of the technical details and his practical experience in general, that the Victor company to-day enters the market with a complete line of standard apparatus, destined to take the foremost rank in the field.



THE "VICTOR" TELEPHONE SWITCHBOARD.

Phœnix Carbon Manufacturing Company.

A meeting of the shareholders of the Phœnix Carbon Manufacturing Company, of St. Louis, will be held on August 31, 1898, for the purpose of considering and acting upon a proposition to increase the capital stock of the company from $160,000, the present amount, to $500,000. The largely increased business of the company necessitates the increase of capital.

INDEPENDENT TELEPHONE ASSOCIATION.

(Concluded from page 8).

Your committee further recommend that Section 1 of Article VII be amended by striking out the words and figures "$2,500 per year," and inserting the words and figures "$1,200 per year," thereby reducing the salary of the president of the association from $2,500 to $1,200 per year.

Your committee further recommend that Article XIV be amended so as to read as follows:

"The election of officers shall be by ballot whenever two or more names are presented for the same office, and shall be conducted by three judges and two clerks, to be selected by the presiding officer. The presiding judge shall announce the name of the voter before the ballot is deposited in the ballot box, and should any member challenge the vote, the judge shall then proceed to hear the objection, and shall determine the rights of the voter. No vote shall be cast upon the election of officers or any other question which may be voted upon at any meeting of said association except by a member thereof present in person."

These changes met with unanimous approval of the members present.

After the adoption of the report of the revisional committee the association proceeded to the election of officers, and the following were elected for the ensuing year: President, James M. Thomas, Chillicothe, Ohio; first vice-president, H. C. Young, Columbia, Pa.; second vice-president, S. T. Slade, Oskaloosa, Iowa; third vice-president, J. B. Weare, Grand Rapids, Mich.; secretary and treasurer, W. J. Vesey, Fort Wayne, Ind.; first assistant secretary, Geo. W. Beers, Fort Wayne, Ind.; second assistant secretary, D. C. Dow, Cobleskill, N. Y.; advisory board, James M. Thomas, Chillicothe, Ohio; W. J. Vesey, Fort Wayne, Ind.; H. B. Critchfield, Mount Vernon, Ohio; Hugh Dougherty, Bluffton, Ind.; E. B. Fisher, Grand Rapids, Mich.

After the election of officers and their assuming their respective duties the following resolution was offered:

Whereas, The express companies have in many cities all over the country, presumably at the instigation of the Bell Telephone monopoly, issued orders directing the taking from their several offices such telephones as are not furnished free of charge; and

Whereas, We regard this act as a direct assault upon the independent telephone interests of the whole country; therefore, be it

Resolved, That the Independent Telephone Association of the United States in annual convention assembled, believing that just compensation for service and a right to enter into a fair competition in every line of business is the inalienable right of American citizens, do denounce this action of the express companies as an outrage upon the common rights of citizenship, which we advise and urge all the local independent companies to resent each in its own way, appealing to their patrons and fellow citizens to aid them in their efforts by sending as many of their light shipments by mail or fast freight as possible, and we especially recommend that all independent telephone companies order all their own exchange and line supplies shipped in like manner.

This resolution, after full discussion and careful consideration, was adopted without a dissenting vote.

After transacting miscellaneous business and general discussion, the association adjourned to meet in June, 1899, at a time and place to be hereafter fixed by the executive committee, unless sooner called in convention by the president.

AT THE TELEPHONE CONVENTION.

The various manufacturers of telephone apparatus in Chicago and vicinity took advantage of the opportunity by either having samples of their products on exhibition, or taking the delegates over to their several factories, of which Chicago has now by far the greater number in the United States.

The Sterling Electric Company was well represented by manager W. E. Doolittle, chief engineer F. B. Cook and the always enthusiastic Jas. G. Nolen, Jr., who recently joined the forces of the Sterling Company. Each of the gentlemen had always an interested crowd of listeners who did not seem to tire of hearing about the merits of Sterling apparatus, which, as Manager Doolittle puts it, is always .999 fine.

The Victor Telephone Manufacturing Company, whose advent in the manufacturing field is announced elsewhere in these columns, had parlors D and E, immediately adjoining the convention hall, fitted up in a lavish manner as reception and exhibition rooms. The several samples of the company's products elicited nothing but favorable comment from all competent judges, and it is hinted that Manager Blaine booked several important orders during the meeting.

J. A. Roebling's Sons Company's interests among the many wire users were well taken care of by Mr. Chas. H. Sewall, who came in at intervals to greet many of the firm's customers.

Manager J. R. Wiley, of the Standard Underground Cable Company, found few telephone people who had not already become acquainted with the excellent qualities of the company's wires and cables.

President P. C. Burns, of the American Telephone Manufacturing Company, was present each day, leaving one of his able aids, Mr. I. J. Kusel, on the ground when compelled to join any of the many excursions to the company's factory.

Engineer Wm. Meissner, of the company, was a frequent caller, and found many managers anxious to meet the designer of so much of the American apparatus.

Jul. Andrae & Son's Company, of Milwaukee, had Mr. Jas. S. Healy on the ground, explaining the many good features of Andrae telephones, which he claims are like Andrae cycles, "they never disappoint."

A mere hint at an invitation to inspect the factory of the Stromberg-Carlsen Telephone Manufacturing Company, extended either by President Stromberg or Mr. Hy. Shaefer, was sufficient to cause a great many telephone managers and friends to make a visit to the company's premises on Jackson boulevard, where the new central energy system was shown in operation and an opportunity given to note the careful and systematic manner in which Stromberg-Carlsen apparatus is made.

The always appreciated decks of playing cards of the American Electrical Works were freely distributed by Manager Donohue, of the Chicago office, in order that all delegates would have some way of passing the time on the homeward trip and at the same time be reminded that there are no wires or cables excelling the American.

The pleasure of keeping the Western Telephone Construction Company's apparatus and its merits prominently before all interested in telephony could not have been assigned to a couple of more capable and energetic gentlemen than general superintendent H. C. Dodge and Mr. Harry Platt. Both were much in evidence and through their earnest and energetic manners made many converts to the already large number of customers who use Western apparatus.

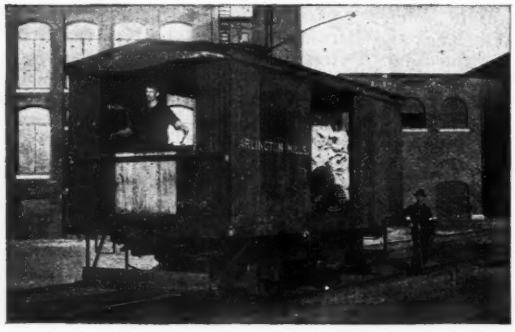
Wall Street and the Electrical Stock Market.

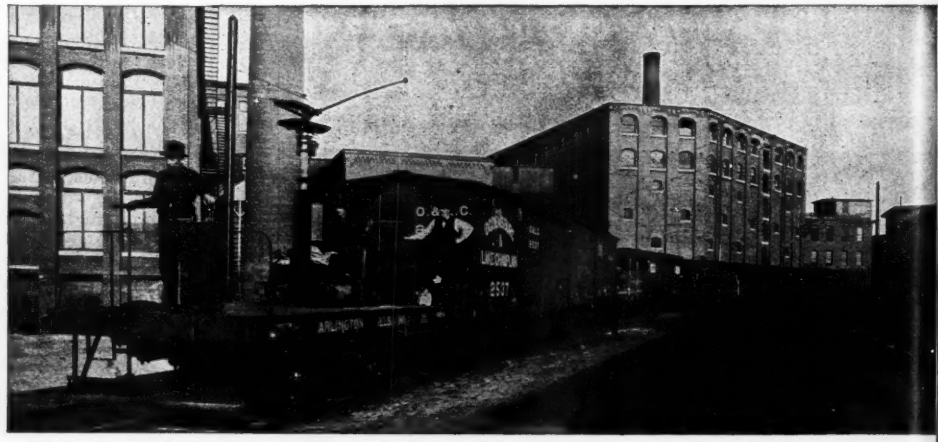
During the past week there was a slight upward movement in stocks, in which electrical securities shared. The most important matter of the week was a meeting of the directors of the General Electric Company, at which it was voted to recommend to the stockholders a reduction in both the common and preferred capital of the company of 40 per cent. This settlement is regarded as satisfactory to the common stockholders, and especially favorable to the preferred stockholders. A stockholders' meeting to discuss the matter will be held at Schenectady on August 10. If this plan is adopted, as it probably will be, the new capital stock will be as follows: Common, $18,376,000; preferred, $2,551,200; debentures, $6,000,000. On the basis of the new capitalization, $1,275,000 will be required annually to pay 7 per cent upon the preferred stock and 6 per cent upon the common stock.

Wall Street, July 2.

Electric Locomotives at the Arlington Mills.

A striking instance of economy in actual money, and elimination of trouble and delay induced by supplanting a steam haulage service with electric traction, is afforded by the installation recently made by the General Electric Company for the Arlington Mills, Lawrence, Mass. These mills have about two miles of track running from the main line of the Boston & Maine Railroad into the yards, and throwing off spurs into the alleys between the different buildings. Previous to the change to electrical service, the haulage of the entire output of the mills to the main line, the haulage of the material from building to building, as well as the necessary switching about the yards, was done by a steam locomotive rented from the railroad. For this service the Arlington Mills paid an annual rental of several thousand dollars, and were, moreover, frequently put to great inconvenience and delay on account of the unavailability at times of any locomotive.





FIGS. 1 AND 2.—ELECTRIC LOCOMOTIVES AT THE ARLINGTON MILLS, LAWRENCE, MASS.

The successful results obtained with electric factory locomotives by other mills in New England, notably at Whitinsville, Mass., and Taftville, Ct., attracted the attention of the managers of the Arlington Mills to the question of electric haulage, which they took into serious consideration. As every case, in which electric traction has been adopted in factories, showed an improved service, as well as an actual money economy, electricity as a motive power was decided upon.

The electrical installation consists of a small generating plant and two electric locomotives, one of the box type and the other a platform car. The generating plant consists of a standard G. E. 75-kilowatt 500-volt railway generator, driven by belt from an Armington & Sims high-speed engine. The generator readily answers all calls upon it, with absolutely no heating or sparking, although it is occasionally subjected to very heavy overloads when both motors are handling a train of more than the usual number of loaded cars.

The box-car locomotive used for hauling material about the yards is shown in Fig. 1, and is equipped with two G. E. 800 27-horse-power motors and series parallel controllers. The platform locomotive is used to haul trains of loaded cars from the yards to the main line, and empties from the line to the mill tracks, and to do all the drilling in the yards.

The equipment of this locomotive consists of two 50 horse-power G. E. 1,200 motors with the necessary series parallel controllers. In hauling heavy trains it is assisted by the box-car locomotive. Together they are able to handle trains of 30 to 40 empties, or 12 to 14 loaded cars with comparative ease and celerity. To give the necessary adhesion to the more powerful locomotive, to enable it to handle heavy loads, about six tons extra is placed on the platform.

Perhaps the most interesting feature is the comparison between the cost of the electric plant and the expense formerly entailed by the use of the superseded steam locomotive. The cost of the entire plant was very little in excess of one year's rental of the steam locomotive. No more men are employed about the electric locomotive, the labor cost has not risen, and the consumption of coal is scarcely felt on the main plant. Furthermore, the plant being always ready, cars may be shifted at any time during the day or night.

The new system is thus both economical and advantageous, and the appreciation of the Arlington Mills is, perhaps, best shown by the fact that a second platform locomotive is shortly to be added to this haulage plant.

ELECTRIC LIGHT FLASHES.

Petoskey, Mich., will be bonded for $16,000 to secure a commercial electric lighting plant.

The old electric light plant at Terre Haute, Ind., has been sold to A. J. Crawford for $40,000.

The Edison Illuminating Company of Detroit, Mich., has increased its capital stock from $350,000 to $500,000.

The electric light plant of the Home Electric Company, Baton Rouge, La., has been destroyed by fire, at a loss of $13,000.

At the annual meeting of the directors of the Berkeley, Cal., Electric Lighting Company the following officers were re-elected: President, J. A. Britton; vice-president, A. S. Blake; secretary and manager, W. E. Topham; directors, A. T. Eastland, J. J. Mason and J. T. Wright.

At the annual meeting of the Franklin Electric Company, of Chambersburg, Pa., the following directors were chosen: Hon. W. Rush Gillan, F. H. Shumaker, John G. Orr, G. W. Britsch, S. Z. Hawbecker, G. W. Klee, Van T. Haulman. The directors afterward organized as follows: S. Z. Hawbecker, president; W. Rush Gillan, vice-president; G. W. Klee, secretary; W. L. Ritchey, treasurer; S. Z. Hawbecker, general manager.

At the annual meeting of the Lyons, N. Y., Electric Light and Power Company Dr. J. W. Putnam, J. S. Sheffield, J. J. Paton, M. E. Mirick, Hiram M. Mirick, J. W. Van Etten, H. A. Austin, C. H. Gucker and J. S. Jordan were elected directors. At a recent meeting the directors elected the following officers: President, Dr. J. W. Putnam; vice-president, J. S. Jordan; secretary, J. W. Van Etten; treasurer, C. H. Gucker.

LITERARY.

To the July number of the *North American Review* Rufus Fairchild Zogbaum contributes an interesting article on "The Regulars in the Civil War," describing vividly the services of these brave men, their sacrifices, prowess, discipline and fortitude, their steadiness under conditions of dismay and panic, their enthusiasm and bravery in attack, and their stubborn and courageous resistance in retreat.

The ELECTRICAL REVIEW has received the tenth annual report of the Department of Public Safety, city of Pittsburgh, for the fiscal year ending January 31, 1898. The report of the Bureau of Electricity is made by superintendent Morris W. Mead. The fire-alarm and police telegraph systems in the new building of the Department of Public Safety have been reconstructed with storage batteries, which are charged from dynamos in the cellar of the building. After nine months' service the bureau finds that the storage batteries have operated perfectly and at far less expense than would have been the case with gravity batteries. Telegraph poles have been largely removed from the business part of the city and the main thoroughfares have been greatly cleared up. A complete interior telephone system has been installed in the building of the Department of Safety, connecting all offices through the fire-alarm exchange.

A special meeting of the stockholders of the New England Telephone and Telegraph Company will be held at the company's office in New York city at 10 A. M., July 6. Stockholders will act upon the recommendation of the directors that the capital of the company be increased from $12,000,000 to $15,000,000.

HIGH-POTENTIAL AND THREE-WIRE DISTRIBUTION COST COMPARED.

BY H. A. WAGNER.

Comparing the cost of individual transformers and high-potential distributing mains with the three-wire system of mains at low potential, we do not find a great difference in first cost in favor of the alternating. We do find, however, that the Edison feeders for the same distance cost about 31 times as much as for alternating current at 1,100 volts, 125 times as much at 2,200 volts, or 500 times as much at 4,400 volts. It would then appear that if we could apply alternating current to the feeders at high potential and transform down for the mains, we might reach the lower first cost of the ordinary alternating-current system and possibly retain all the best features of the direct current. To accomplish the former, the transformers must be provided at a small proportion of the cost of the alternating-current feeder, and to do the latter they must not increase the average losses in the system. It is obvious that we could with alternating current move our station to any reasonable distance from our center of distribution, and at comparatively small additional cost to feeders. The whole problem then seems to come down to transformer efficiency and means of regulation.

To consider the matter of regulation first, we see at a glance that we can not use the direct-current method of regulation by supplementary bus bars, but we can use the booster method, and can, moreover, apply a static booster to each feeder to regulate within any desired limits and with as small gradations as necessary. In fact, the booster method of regulation was first applied to alternating-current distribution, and operates with much less average consumption of energy than either the supplementary bus or direct-current booster method. In this important consideration we can therefore improve on and simplify direct-current methods.

The means of regulation having been in this way provided for the feeders, it remains to be considered what we shall do to eliminate the effects of transformer drop. As we have determined on a secondary low-potential, three-wire distributing system of mains, we can altogether dispense with high-potential mains and limit the high potential to the feeders. If we do this we can conveniently have the transformers of the same unit capacity as the feeders, and arrange each with its primary connected to its independent feeder and its secondary feeding into the three-wire mains. We know that the effects of our feeder drop are eliminated if we regulate by pressure wires from the feeder ends. In the same way the effect of our transformer drop may be eliminated by bringing pressure wires from the secondary terminals. The feeder drop and transformer drop therefore become one, and are cared for in the same way. We can even secure better general regulation than with the direct-current system, as we have a better form of feeder regulator and have eliminated the effects of transformer drop.

Now, to return to the transformer itself and its efficiency. It is evident that, with this system, the transformer capacity need be no greater than that required for maximum station load, instead of more than twice that amount, or nearly equal to that required for the total number of lamps connected. This at once doubles the average load on our transformers, and raises the average efficiency. It also incidentally reduces the first cost of transformers in still greater proportion. We also know, however, that transformer efficiency at light loads is dependent on the iron loss, and that this is interdependent with the regulation or drop. If we can increase the drop, we can decrease the iron loss, and thereby greatly increase the average efficiency. Having provided against any interference with the regulation of the system by the transformer drop, we can afford to increase that to the heating limit of the copper. In this way, a 100-kilowatt transformer can be built with an average efficiency of over 98 per cent. The entire transformer loss can, moreover, be more than made up by the less loss in feeders, which we would naturally have with alternating current.

Cutting Submarine Cables.

[From the London Electrician.]

With reference to a statement made in the daily press, that if the United States interrupt telegraph communication with Spanish colonies Spain will retaliate by severing the cables between the United States and Europe, we desire again to point out in the strongest manner the futility of such an attempt, which would only result in injury to neutral property without effecting the desired object, and would inevitably lead to heavy claims for damages, to say nothing about the practical impossibility of breaking some 12 or 13 cables before those first severed are repaired. We have it on the authority of one of the Atlantic company's that they have transmitted readable code words through a cable 500 miles long, broken about midway, by means of apparatus invented by A. C. Brown, of the Single Wire Multiple Telephone Signal Company.

At a recent meeting of the Plymouth & Campton, N. H., Telephone Company the following officers were elected: President, Plummer Fox; treasurer, F. N. Weeks; secretary, Gen. George H. Adams; manager, W. I. Lee.

MAGNETIC LEMONADE.

HOW THE CITY HALL REPORTERS IN NEW YORK GOT EVEN WITH THEIR TOO NUMEROUS THIRSTY CALLERS.

The cooler looked the same as usual, but the careful observer might have noticed that the tin cup was attached by a wire instead of the usual chain, and that another wire extended from the faucet around the body of the cooler, and if he had the hard-working mentality of a Sherlock Holmes he might have "deduced" therefrom an electric battery in a near-by desk. A few lemons had been purchased, sliced, and floated in the water, together with a big lump of ice. The first to test the new drink was Marty Keese, the City Hall janitor. Among many pleasing qualities, Marty has one that does not endear him to the political reporters, a habit of saying to any visitor at the City Hall who inquires where he can get a drink of water:

"Go right into the reporters' room and you'll find a big cooler. Say nothing to nobody, and they'll never know you ain't got a right there."

Consequently, when Marty approached the cooler there was great expectancy of poetic justice.

"Hot day," remarked Marty, as he picked up the cup.

"Going to be hotter," somebody replied.

"Think so?" asked the janitor, reaching for the faucet. "I've always noticed—ow-wow!"

At the moment of contact between his right hand and the faucet Marty leaped in the air and performed strange antics. Then he sprang back and glared at the cooler with wrathful suspicion.

"What's into the thing, anyway?" he cried.

"Nothing but a little lemonade."

"Lemonade! Nothing as weak as lemonade ever gave me them kind of shakes."

"That's our new electric punch, Marty. Like it?"

"It's great," said Marty, as the scheme dawned upon him. "I'll fetch my friends in."

Presently he returned with a 250-pound copper, whom he detained at the door long enough to explain in an impressive whisper:

"Them fellows is having lemonade, and you want to go right in and get some before it's all gone."

In view of the size of the subject, a strong current was turned on, and the fat copper wallowed like a colicky hippopotamus, and left with unslacked thirst, threatening to arrest everybody in sight.

"Pinch 'em," cried Marty between chuckles. "Any judge'll hold 'em on your complaint. Make it assault and battery—'specially battery.'"

Next in order was the policeman who had complained on Saturday of the condition of the cooler. His plaint on this occasion was incorporated in one vigorous whoop, followed by an outburst of vigorous, if somewhat indefinite, profanity. Then came Dave Roche, the Mayor's chief marshal.

"Lemonade?" said Dave. "Well, I guess so! Lemme at it."

Nobody barred his path. It was a very mild current that he struck and a wave of perplexed alarm passed over his face.

"I mistrust there's something wrong with me," he said, putting his hand to his forehead.

"Maybe it's the heat," came the suggestion.

"Maybe it is. I've queer thrills up my arms. Was any of you ever sunstruck?"

Here the man at the switchboard turned the current on full and the marshal went up in the air as if a spring board had suddenly sprung under him.

"That's no sunstroke," he cried when he came down; "that's a rotten trick," and he departed fuming.

Two politicians and one Si Ling, who is manager of a downtown club, then did their little turns to the edification of an appreciative audience, and a Weary Willie from the park benches galvanized into rapid action for once in his life. Mike Haley, the watchman, diagnosed his case as rheumatic cramps after connecting with the cooler. A Tamsen ex-politician tackled the lemonade with glee and gave off compound polysyllables as a broken trolley wire emits sparks. Finally came Billy Leary, former secretary of the Park Board and a distinguished scientist. Immersed in thought he entered the room, walked straight over to the cooler and connected himself with the wires. Back he leaped, his eyes starting from his head.

"Say, what kind of water do you call that?" he cried.

"Ordinary drinking water. What's wrong with it?"

"Wrong! Why, it's electrified. That's what's wrong with it."

"Must be some mistake. It was all right a little while ago."

"Don't you suppose I know when I've got an electric shock! I tell you there's an electric eel in that cooler."

Mr. Leary then proceeded to theorize learnedly, and his remarks about the remarkable power of these singular galvanic fishes were illustrated by a ward detective who did an animated song and dance and departed without getting his drink. Then somebody explained and the scientist went forth stating explicitly that wisdom had no chance before scoffers. By the middle of the afternoon thirsty applicants had become so rare that a sign was put up reading "Lemonade. Help Yourself." But the story of the electric drink had spread abroad, and unless the battery is kept there as a defensive precaution its usefulness will have been pretty well outlived by to-day.—*New York Sun.*

ADVANCE INFORMATION

New Electric Railways.

HAMPTON, VA.—The Hampton Electric Railway Company will build an electric power-house, probably near Hampton.

HACKENSACK, N. J.—The Bergen County Traction Company has completed arrangements for an extension of its lines from Fort Lee to this place, and expects to have it working by Fall.

HAGERSTOWN, MD.—The Hagerstown Electric Railway Company, Christian W. Lynch, president, reports that his company is negotiating for site for new electric plant, as the present plant is of insufficient capacity.

ROME, N. Y.—A movement is on foot to build an electric road from the terminus of the belt line in New Hartford to Clayville, with a branch to Clinton. The franchise has been secured from New Hartford to Chadwick.

HARRISBURG, PA.—The Erie Rapid Transit Street Railway Company has been chartered to build a line 20 miles from North East, Erie County, to the city of Erie. The capital is $300,000. William E. Noyes, of Erie, is president.

CLEVELAND, OHIO—The Pennsylvania & Ohio Railroad Company has been granted a 50-year franchise to build and operate an electric street car line to extend east from Painesville, via North Ridge, Middle Ridge and Narrows road to the east line of Lake County.

NEWARK, N. J.—The Orange and Passaic Valley Railway Company has been incorporated. The capital stock is $1,000,000. The incorporators are Charles A. Sterling, of East Orange; William Scheerer and John A. Ely, of Orange; Albert B. Carlton, of Elizabeth, and Bird W. Spencer and Thomas M. Moore, of Passaic.

WATERVILLE, ME.—John T. Richards, Chas. D. Brown, Elisha Morgan, Edward W. Heath and H. M. Mansfield have formed themselves into a corporation for the purpose of building and equipping an electric railroad between Benton Falls and Fairfield for freight and passenger traffic. The road will be known as the Fairfield & Benton Falls Road, and will probably be constructed this season.

DES MOINES, IOWA—The Duluth & New Orleans Railway Company, with a capital stock of $300,000, has been incorporated. It is proposed to build a line of railway from Duluth, Minn., to some convenient gulf point, presumably Port Arthur. The company's headquarters are at Nevada, Iowa. The first board of managers is composed of Robert B. Hunter, Topeka, Kas.; Thomas Wardell, H. A. Wardell, S. V. Wardell, Osage, Iowa; J. V. Wardell, Mitchell, Iowa; H. C. Arnold, Minneapolis; G. W. Lanke, New Hampton, Iowa.

Electric Light and Power.

ELKTON, MICH.—An electric light plant will be established here.

GOWER, MO.—The Mayor may be addressed for information concerning erection of electric light plant.

RICHMOND, VA.—The Southside Railway and Development Company will probably build an electric plant.

HUNTSVILLE, ALA.—The Huntsville Electric Company's new electric light plant has been placed in operation.

LAMAR, COLO.—The Lamar Electric Light Company has been incorporated; incorporators, A. C. Bent, M. Stram and J. W. Bent.

RUSTON, LA.—Fred W. Price, Mayor, may give information concerning establishment of electric light plant, etc., for which $50,000 worth of bonds will be issued.

ROCKFORD, ILL.—The Rockford Electric Light and Power Company has been incorporated; capital stock, $50,000; incorporators, F. M. Ellis, W. E. Dewey and C. F. Warner.

LOUISVILLE, KY.—The Illinois Power Company has been incorporated. The capital stock is $50,000. Incorporators are Robert E. Woods, H. S. Brashear, C. C. Boswell, D. E. Coulter and R. A. Brashear.

DETROIT, MICH.—The Peninsular Electric Light Company has been reorganized by David Whitney, Jr., George Peck, James E. Clough, Hoyt Post, S. J. Murphy, S. Dow Elwood, J. L. Hudson and others; capital stock, $150,000.

NANTICOKE, PA.—The People's Electric Light, Heat and Power Company has been incorporated: M. W. Morris, Pittston; C. E. Stegmaier, Dr. J. A. Bullard, Sol. Hirsh, S. Wormser, E. W. Mulligan, Dr. W. G. Weaver and J. W. Morris, of this city, incorporators.

New Telephone and Telegraph Companies.

BLAND, VA.—Judge Samuel W. Williams will rebuild the Bland telephone system.

CROOKSTON, MINN.—The Crookston Telephone Company has sold out its stock to local capitalists.

DOYLESTOWN, PA.—The Delaware & Atlantic Telephone Company is preparing to extend its service to Willow Grove.

CHARLESTOWN, W. VA.—The Gordon Telephone Company, of New York, has been granted franchise for the establishment of a telephone system in this city.

ATHENS, ALA.—The American Telephone and Telegraph Company has been granted franchise for the construction of a long-distance telephone and telegraph system.

BIRMINGHAM, ALA.—The American Telephone and Telegraph Company has been granted franchise for the construction of a long-distance telephone and telegraph system.

CHICAGO, ILL.—Illinois Telephone and Telegraph Company has been incorporated by Ralph W. Bowman, Samuel H. McLaughlan, Thomas J. Holmes; capital stock, $250,000.

HUTTONSVILLE, W. VA.—The Beverly & Marlington Telephone Company has been incorporated by Perry Bosworth, J. L. Bosworth, A. S. Bosworth, T. C. Russell and C. A. Barlow; capital stock, $5,000.

NEW DECATUR, ALA.—The American Telephone and Telegraph Company have been granted permission to construct, operate and maintain telephone and telegraph lines along and under the highways of New Decatur.

New Incorporations.

COLUMBIA CITY, IND.—The Ruch Electric Company has been incorporated, with a capital of $21,500. The incorporators are Joseph H., Samuel A. and George W. Ruch.

NEW YORK, N. Y.—The Eberle Construction Company has been incorporated to construct and equip railways to be operated by electricity and steam; capital stock, $24,000; directors, David Longecker and Charles R. Eberle, of Philadelphia; Edwin C. Stout, Alva Oatman and Thomas A. Matthews, of New York city.

NEW YORK, N. Y.—H. B. Coho & Company has been incorporated to manufacture machinery for the generation of light, heat and power; capital, $100,000; directors, H. B. Coho, of Mount Vernon; A. L. Livermore, of Yonkers; George C. Hoffman and R. J. Mulligan, of New York city, and Frank P. Coho, of Lancaster.

Increase of Capital.

PEORIA, ILL.—Eagle Electric Works has certified to an increase in capital stock from $5,000 to $15,000.

FORT WAYNE, IND.—The Home Telephone and Telegraph Company has increased its capital stock from $100,000 to $250,000.

This Telegraph Girl can Wigwag.

Shortly after the troopship "Panther" anchored off Tompkinsville, says the New York *Sun*, a girl in a pink shirt waist appeared on the end of the wharf with a signal flag and proceeded to wigwag at the ship. Many strange sights of war have the "Panther's" men seen since they left this port for Cuba, but girls in pink shirt waists who stand on docks and wigwag code to Uncle Sam's fighting ships are not included in their list of experiences. After the officers had decided that they were awake and in possession of their senses, they discovered that the girl was signaling that there was an official message for the ship. A boat was sent in, and the message, which was from Washington, was brought out. Later on one of the officers who went ashore found the wigwagger in the telegraph office busily ticking off a message.

"What is your ship's call?" she asked.

"A. P., I believe," said the officer.

"No; that's the 'St. Paul,'" replied the girl.

"Oh, yes; I had forgotten. It's A. T. How do you happen to understand wigwagging?"

"Oh, I've taken it up for convenience since the war began," said the girl, and went back to her ticking.

International Electric Exhibition in Como, Italy, 1899.

Como, the birthplace of Alexander Volta, is preparing to worthily celebrate the 100th anniversary, which will take place in 1899, of the invention of the voltaic or electric pile. To commemorate the important event, which gave rise to the greatest discoveries of the present century, Como will open, from May 15 to October 15, 1899, an International Electric Exhibition, to which will be annexed a national exhibition of the manufacture of silk, and an international exhibition for the machinery, preparation and process of working the same. Como invites Italian and foreign electricians to a congress, which will give an opportunity for free discussion in the field of science and of practice.

Como is a flourishing, industrious and commercial city, situated on the main line of St. Gothard and 40 kilometres from Milan, which is the richest and most industrious city of Italy. It is pleasantly situated at the foot of the Rhætian Alps and on the shores of the most charming lake of Lombardy, to which it gives name, all surrounded by suburbs and villas, the happy homes of a thriving population and the princely abodes of Italians and foreigners.

A special exhibition of electricity can not fail to succeed in Italy, where the abundant hydraulic power greatly facilitates electric works.

The application of electricity to the manufacture of silk must afford great interest in Como, where the silk work is of ancient date and makes every day rapid progress, though still indebted to foreign countries for its machinery and implements. Foreign inventions will be therefore greatly valued at the exhibition, and will be well placed.

For the encouragement of exhibitors the city of Como has decided to give a sum of 10,000 francs in prizes for new inventions in the field of electricity.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED JUNE 28, 1898.

606,208 Transformer box and hanger; L. Gutmann, Peoria, Ill.—Consists of a main body tapering toward the upper end, a tapering rim forming part of said hanger, located in a parallel plane to the main body, and holes or recesses in said main body for retaining screws, bolts or other devices for fastening.

606,279 Electro-mechanical musical instrument; Geo. H. Davis, New York—Consists of a continuously rotating friction drum, a vertically movable striker rod arranged in close proximity to said friction drum and an armature connected thereto, said striker rod being arranged to engage and actuate a sounding device when raised, an electro-magnet disposed opposite said armature and operating when energized to draw the striker rod into frictional engagement with the rotating friction drum, and means for automatically making and breaking the magnet circuit at predetermined intervals.

606,285 Telephone system; W. A. Gustafson, Joliet, Ill.

606,312 Electric igniter for gas engines; A. J. Tackle, Oakland, Cal.

606,329 Printing telegraph; B. A. Brooks, Brooklyn, N. Y.—A combined transmitter and distributer, comprising a continuously revolving shaft, a set of key levers, a circuit-changer or changers, and mechanism between the levers and shaft, whereby the depression of any key changes the circuit to send an impulse over the line after a predetermined time corresponding to the key.

606,330 Electro-hydrostatic automatic car-brake; J. Buchel, New Orleans, La.

606,342 Apparatus for welding, brazing and soldering by electricity; Albert Hirsch, Berlin, Germany—Consists of a handle, a stem supported thereby, a plurality of electrode carriers pivoted to the stem, electrodes carried by the carriers and inclined toward each other at an angle, and manually operated means for swinging an electrode carrier so as to bring the electrodes into position as to strike the arc.

606,356 Electrical sign; M. Norden, New York, N. Y.

606,386 Gas engine; T. H. Hicke, Fort Wayne, Ind.

606,405 Alarm system; C. Coleman, Chicago, Ill.

606,407 Dynamo-electric machine; R. S. Dobbie, Jersey City, N. J.—Consists of a dynamo-electric machine having two or more pairs of pole-pieces, and a switch for rendering said machine bipolar or multipolar at will.

606,449 Telegraph instrument; J. L. Cutler, Cincinnati, Ohio.

606,450 Railway signaling system; C. H. Davis, New York, N. Y.

606,526 Secondary voltaic battery; L. Epstein, London, England.

606,549 Portable electric drill; E. Holmes, London, England.

INDUSTRIAL NOTES.

The General Electric Company will place a large working exhibit at the twentieth triennial exhibition of the Massachusetts Charitable Mechanics' Association at Boston.

The Warren-Medbery Company have about completed the addition to their new works at Sandy Hill, N. Y., and are setting up some very heavy machinery, to be used in the construction of their inductor alternator. The sale of these machines is rapidly increasing, and the works are running to their utmost capacity. The line of knife switches, which they are manufacturing, is very extensive, and the demand for same is rapidly improving.

The Holtzer-Cabot Electric Company, of Boston, is presenting to the public an improved gas engine igniter, which is stated to be the most satisfactory machine yet devised for igniting gas and gasoline engines. It never fails to generate, and requires practically no expert knowledge nor attention to run it. The battery, which may be four or five cells of any ordinary open circuit form, is used but for a few moments to start the engine; consequently will last indefinitely.

The Syracuse Construction Company, of Syracuse, N. Y., are erecting new buildings in connection with their electric railroad plant. The buildings consist of a boiler house 60 feet by 90 feet, which is an all fireproof building, having steel framework, covered with corrugated iron on the sides and roof. There is also an engine-room 65 feet wide by 80 feet long, having a steel frame and brick sides. The other building is a car barn and repair shop, 65 feet wide and 170 feet long. This building also has steel framework construction with corrugated iron sides. All these buildings have been designed and are being erected by the Berlin Iron Bridge Company, of East Berlin, Ct.

Mr. C. L. Mullinix, formerly a partner in the Ohio Electric Specialty Company, having sold out his interest in that concern, has formed the Mullinix Electric Company, and will manufacture electrical specialties in Cincinnati, Ohio. Mr. Mullinix was the designer of the Perfection dynamo brush. This brush he has improved, he announces. The improved brush will be manufactured under the name of the Mullinix dynamo brush hereafter. The new firm will also manufacture all the ordinary types of woven wire brushes and also the leaf copper brushes. Other specialties will be added as soon as they can be taken up.

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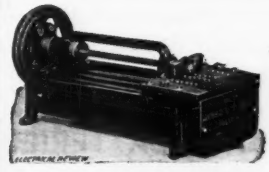
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Kindred.... ...Interests

The Ericsson Telephone Company, 20 Warren street, New York city, is sending out an excellently illustrated folder price list of their well known telephone apparatus and supplies. These telephones are made in a variety of forms and styles for every service. The folder may be obtained free on application.

The Sterling Electric Company, Cnicago, last month shipped a complete central office equipment to Dr. F. A. Winnie, at Brockport, N. Y., which now enjoys the benefits of a modern, well equipped telephone exchange. The service began on June 5, and the indications of its successful continuance are most favorable.

The Walker Company, Cleveland, Ohio, has prepared a handsome brochure entitled "Some Lighting Plants by Walker Company." The cover is printed in four colors, and the contents is composed of a series of well executed half tone engravings of lighting plants, accompanied by brief descriptions, installed by the Walker Company.

The Central Electric Company, of Chicago, are pushing to the front a new type of standard base, six-candle power lamp. This lamp is made for standard voltages, is three and one-half inches long over all and about two inches in diameter. It is exceedingly economical of current, and will undoubtedly find very popular use for signs and other purposes where low candle-powers are desired.

The International Correspondence Schools, of Scranton, Pa., have issued a very attractive brochure printed in colors, describing fully what their system of correspondence instruction is, and how it has brought about an improvement in technical books. The information given is of a valuable character to engineers and every one interested in technical education. The brochure is a handsome piece of printing, and may be had free on application.

Eugene Munsell & Company, of 117–119 Lake street, Chicago, are sending to their western customers a very neat blotter, on which are embossed the Cuban and American flags, under which are the words, "Victorious on Sea and Land!" The printed matter beneath these words refers to the rapid development of a great business in a great city, and that they don't need any better advertisement as to the excellence of their "mica" or service rendered.

The Sterling Electric Company, Chicago, is not complaining of a lack of orders for its standard line of exchange and line equipment. Among the recent orders may be mentioned those from the Home Telephone Company, New Albany, Ind., for a complete line of Sterling cable terminals; from the E. H. Martin Telephone Company, Webster City, Iowa, for a switchboard and full line of terminals; from the Livingston County Telephone Company, Pontiac, Ill., for a complete exchange equipment, and from the Boone County Telephone Company, Boone, Iowa, which has just placed an order for one of the finest toll boards of its size that will be used in the state.

The United Gas Improvement Company, of Philadelphia, Pa., are making extensive additions to their gas-producing plant. These plants are known as the Twenty-fifth Ward and the Point Breeze locations. At the Twenty-fifth Ward Gas Works they are building a new scrubber house, 45 feet wide and 120 feet long; a purifier house, 86 feet wide and 180 feet long. At the Point Breeze works they are erecting a new boiler and engine room, 220 feet long and 55 feet wide; a condenser building, 40 feet wide and 105 feet long; a purifier building, 86 feet wide and 180 feet long; a generator house, 100 feet wide and 184 feet long; a meter house, with additions for exhaust and valve room, having a width of 70 feet and a total length of 223 feet. All of these buildings are of steel frame construction, brick side walls, and slate roofs supported on metal purlins carried by clear span trusses. All the structural steel work for this extensive plant is being furnished and erected by the Berlin Iron Bridge Company, of East Berlin, Ct.

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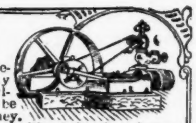
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